

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF PENNSYLVANIA

MICHELLE MCMUNN, et al.,)	
Plaintiffs,	)	Civil Action No. 10-143
vs)	
)	
BABCOCK & WILCOX POWER)	
GENERATION GROUP, INC., et al.,)	
Defendants.)	
)	
JESSI ANN CASELLA, et al.,)	
Plaintiffs,	)	Civil Action No. 10-368
vs)	
)	
BABCOCK & WILCOX POWER)	
GENERATION GROUP, INC., et al.,)	
Defendants.)	
)	
MICHAEL P. HUTH, et al.,)	
Plaintiffs,	)	Civil Action No. 10-650
vs)	
)	
BABCOCK & WILCOX POWER)	
GENERATION GROUP, INC., et al.,)	
Defendants.)	
)	
LINDA W. DILICK, et al.,)	
Plaintiffs,	)	Civil Action No. 10-728
vs)	
)	
BABCOCK & WILCOX POWER)	
GENERATION GROUP, INC., et al.,)	
Defendants.)	
)	
BONNIE AIKENS, et al.,)	
Plaintiffs,	)	Civil Action No. 10-744
vs)	
)	
BABCOCK & WILCOX POWER)	
GENERATION GROUP, INC., et al.,)	
Defendants.)	
)	
PATRICIA ALTIMIRE, et al.,)	
Plaintiffs,	)	Civil Action No. 10-908
vs)	

BABCOCK & WILCOX POWER
GENERATION GROUP, INC., et al.,
Defendants.

HEATHER LORRAINE BAYNAR, et al.,
Plaintiffs,

vs

Civil Action No. 10-1736

BABCOCK & WILCOX POWER
GENERATION GROUP, INC., et al.,
Defendants.

MARCIA BAUSTERT, et al.,
Plaintiffs,

vs

Civil Action No. 11-898

BABCOCK & WILCOX POWER
GENERATION GROUP, INC., et al.,
Defendants.

SANDRA L. AMENT, et al.,
Plaintiffs,

vs

Civil Action No. 11-1381

BABCOCK & WILCOX POWER
GENERATION GROUP, INC., et al.,
Defendants.

ELIZABETH MITCHESON, et al.,
Plaintiffs,

vs

Civil Action No. 12-1221

BABCOCK & WILCOX POWER
GENERATION GROUP, INC., et al.,
Defendants.

KAREN L. SKROUPA,
Plaintiff,

vs

Civil Action No. 12-1459

BABCOCK & WILCOX POWER
GENERATION GROUP, INC., et al.,
Defendants.

MARLENE AMENT, et al.,)	
Plaintiffs,)	
vs	)	Civil Action No. 13-186
)	
BABCOCK & WILCOX POWER)	
GENERATION GROUP, INC., et al.,)	
Defendants.)	
)	
PATRICIA ALDENE WEST, et al.,)	
Plaintiffs,)	
vs	)	Civil Action No. 13-704
)	
BABCOCK & WILCOX POWER)	
GENERATION GROUP, INC., et al.,)	
Defendants.)	
)	
ALYNDA TALMADGE, et al.,)	
Plaintiffs,)	
vs	)	Civil Action No. 13-1527
)	
BABCOCK & WILCOX POWER)	
GENERATION GROUP, INC., et al.,)	
Defendants.)	
)	
MARGARET S. CULP, et al.,)	
Plaintiffs,)	
vs	)	Civil Action No. 14-639
)	
BABCOCK & WILCOX POWER)	
GENERATION GROUP, INC., et al.,)	
Defendants.)	

REPORT AND RECOMMENDATION

I. Recommendation

It is respectfully recommended that Defendants' Motion for Judgment on the Pleadings on Counts Two Through Five/Six/Seven Based on Price-Anderson Act Preemption be granted. It is further recommended that Defendants' Motion for Summary Judgment Based on Plaintiffs' Failure to Raise a Genuine Issue for Trial on Breach of Duty be granted. It is further

recommended that Defendants' Motion for Summary Judgment Based on Plaintiffs' Lack of Evidence Regarding Exposure and Dose be granted and that Defendants' Motion to Deem Admitted Rule 56.B.1 Statement of Undisputed Facts in Support of Summary Judgment Based on Plaintiffs' Lack of Evidence Regarding Exposure and Dose be granted. It is further recommended that Defendant Atlantic Richfield Company's Motion for Summary Judgment Based on No Shareholder Liability be dismissed as moot and that Defendant Atlantic Richfield Company's Motion to Deem Admitted Its Local Rule 56.B.1 Statement of Undisputed Facts in Support of Summary Judgment Based on No Shareholder Liability be dismissed as moot. It is further recommended that Defendants' Motion for Summary Judgment Due to Plaintiffs' Failure to Comply With the Court's September 12, 2012 Order be dismissed as moot and that Defendants' Motion to Strike the Supplemental Affidavit of James Melius, M.D., DR. P.H. be dismissed as moot.

II. Report

Plaintiffs brought the fifteen above-captioned actions alleging that Defendants, Babcock & Wilcox Power Generation Group, Inc., B&W Technical Services, Inc. and Babcock & Wilcox Technical Services Group, Inc. (together, "B&W") and Atlantic Richfield Co., as successors in interest to the Nuclear Materials Corporation ("NUMEC"), are responsible for the release of radioactive, hazardous and toxic substances into the environment surrounding two nuclear materials processing facilities located in the Borough of Apollo and in Parks Township, Pennsylvania, during the operation, remediation and/or decommissioning of these facilities. Plaintiffs (at present, approximately 138 individuals who lived and/or worked in the area near the plants) allege that the releases have contaminated the air, soil, surface water and ground water in the surrounding communities and caused them personal injuries and property damages.

Plaintiffs assert jurisdiction under the Price-Anderson Act, 42 U.S.C. § 2210(n)(2), and the Atomic Energy Act, 42 U.S.C. § 2011, and also assert state law claims of negligence, negligence per se, strict liability, civil conspiracy, misrepresentation and concealment, and wrongful death and survival, for which supplemental jurisdiction is asserted pursuant to 28 U.S.C. § 1367(a). As a result of the discovery process, one facility (Parks) has been eliminated and only personal injuries that can be linked to inhalation of enriched uranium (“EU”) released from the Apollo facility during its period of operation (1957-1983) are still at issue in these cases.

Currently pending before the Court are the followings motions filed by the Defendants:

- 1) a motion for judgment on the pleadings, filed in all fifteen of the cases, contending that the state law claims in Counts II-V (in some cases, Counts II-VI and in some cases, Counts II-VII) should be dismissed as preempted by the Price-Anderson Act claims asserted in Count I; 2) a motion for summary judgment, filed in the first eleven cases, contending that Plaintiffs have failed to raise a genuine issue of material fact on the element of breach of duty (because average annual radioactive airborne releases of uranium never exceeded the amounts set by 10 C.F.R. § 20.106); 3) a motion for summary judgment, filed in the first eleven cases, contending that Plaintiffs have failed to present evidence regarding exposure and dose, as well as a motion (filed with their reply brief) to have their statements of undisputed fact deemed admitted; 4) a motion for summary judgment, filed in the first eleven cases by Defendant Atlantic Richfield, contending that Plaintiffs have failed to demonstrate that it can be held liable as a successor in interest to NUMEC, as well as a motion (filed with its reply brief) to have its statements of undisputed fact deemed admitted; and 5) a motion for summary judgment, filed in five of the cases, contending that Plaintiffs failed to comply with the Court’s order of September 12, 2012,

in that some of the Plaintiffs are continuing to allege exposure other than to inhalation of uranium from the Apollo facility, as well as a motion (filed with their reply brief) to strike the supplemental affidavit of James Melius, M.D., DR. P.H. that Plaintiffs filed with their opposition to the motion.

For the reasons that follow, the motion for judgment on the pleadings should be granted, the motion for summary judgment based on Plaintiffs' failure to raise a genuine issue for trial on breach of duty should be granted, and the motion for summary judgment based on Plaintiffs' lack of evidence regarding exposure and dose should be granted (as well as the motion to have Defendants' facts related to this motion deemed admitted). The remaining motions should be dismissed as moot.¹

Procedural History

The first case, McMunn v. Babcock & Wilcox Power Generation Group, Inc., No. 10-143, was filed on January 29, 2010 and assigned to Judge Cercone. Subsequently, ten additional cases were filed and assigned to various district judges. The undersigned volunteered to conduct common discovery on these cases and status conferences were held to set discovery deadlines and resolve issues that arose. On January 24, 2012, a Case Management Order was entered (ECF No. 109)², which required Plaintiffs to provide Defendants with admissible evidence establishing the prima facie elements of their individual claims. After this occurred, Defendants filed motions seeking to limit Plaintiffs' cases based upon the alleged failure to submit such evidence. Pursuant to an order entered on September 12, 2012 (ECF No. 161) and

¹ Although Defendants have requested oral argument for all of the summary judgment motions, the undersigned has determined that oral argument is not necessary and the motions can be decided based on the briefs and evidence submitted.

² For consistency, all citations are to the docket in the McMunn case, No. 10-143.

thereafter affirmed by all the district judges, the motions were granted in part and denied in part and Plaintiffs' claims were limited to theories of exposure based upon inhalation of EU released from the Apollo facility during its period of operation.

A twelfth case, Ament v. Babcock & Wilcox Power Generation Group, No. 13-186, was filed on February 5, 2013. A thirteenth case, West v. Babcock & Wilcox Power Generation Group, No. 13-704, was filed on May 20, 2013. A fourteenth case, Talmadge v. Babcock & Wilcox Power Generation Group, No. 13-1527, was filed on October 14, 2013. Finally, a fifteenth case, Culp v. Babcock & Wilcox Power Generation Group, No. 14-639, was filed on May 16, 2014. Orders have been entered in these four more recent cases reassigning the undersigned as magistrate judge and Judge Cercone as the district judge during the pendency and resolution of the Daubert motions and any motions for summary judgment that are filed and applying the September 12, 2012 Memorandum and Order to the cases.

In March 2013, cross-motions to exclude expert opinions were filed pursuant to Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993). The motions were briefed and a hearing was held on April 30 and May 1, 2013 (ECF Nos. 264-265). On July 12, 2013, a Report and Recommendation was filed (ECF No. 271), which recommended that Plaintiffs' motions be denied and that Defendants' motions (other than the motion to exclude the damages expert) be granted. However, upon review, Judge Cercone filed a Memorandum Opinion and Order on February 27, 2014 (ECF No. 283), in which he declined to adopt the Report and Recommendation and instead denied the Defendants' motions. Although the Court certified the matter for interlocutory appeal (ECF No. 298), on June 6, 2014, the Court of Appeals for the Third Circuit denied permission to appeal and the cases, which had been closed, were reopened (ECF No. 300). The parties then attended a mediation on July 30, 2014, which was

unsuccessful, and engaged in discovery.

On October 17, 2014, Defendants filed the motions currently under consideration.³ Plaintiffs filed their responses to the motions on December 5, 2014, and Defendants filed reply briefs on January 8, 2015. Plaintiffs filed a response in opposition to the motion to strike the supplemental affidavit of Dr. Melius on January 22, 2015. They did not file responses to the two motions to have Defendants' undisputed facts deemed admitted.

The Hall Case

In 1994, a prior case, captioned Hall v. Babcock & Wilcox Co., No. 94-951 ("the Hall case"), was filed arising out of similar claims. Over 500 plaintiffs sued B&W and Atlantic Richfield, alleging personal injuries and/or property damages arising out of emissions released from Apollo and Parks. In August 1998, Judge Ambrose presided over a jury trial of eight sample plaintiffs which resulted in a verdict for them. However, afterward the defendants filed a motion for a new trial, which Judge Ambrose granted on June 29, 1999. See Hall v. Babcock & Wilcox Co., 69 F. Supp. 2d 716 (W.D. Pa. 1999). In 2000, B&W filed a voluntary petition for protection under Chapter 11 of the Bankruptcy Code and all proceedings against it were stayed. The plaintiffs reached a settlement with Atlantic Richfield, which Judge Ambrose approved on March 18, 2008. Finally, the plaintiffs reached a settlement with the reorganized B&W, which Judge Ambrose approved on April 17, 2009. This background is relevant because some of the issues raised herein were raised in the Hall litigation and some of the evidence was presented in

³ On that same date, Defendants also filed three other sets of motions for summary judgment, in which they contended that all the claims should be dismissed due to insufficiency of evidence of causation, that certain individual claims were barred by the statute of limitations and that certain other claims were barred based on releases the Plaintiffs had signed. On October 15, 2014, Judge Cercone denied these other motions without prejudice to refile, if appropriate, after the Court resolved the motions addressed herein (ECF No. 336 in Civ.A.No. 10-143).

the Hall case, as will be discussed below.

Price-Anderson Act Preemption

Defendants move for judgment on the pleadings with respect to all of the state law claims (Counts II-V in some cases, Counts II-VI in others and Counts II-VII in still others) on the ground that they are preempted by the Price-Anderson Act claims in Count I. Plaintiffs respond that the state law claims may be maintained, either as consistent with the Price-Anderson Act claims or as sub-parts of a Public Liability Action (PLA). For the reasons that follow, Defendants' motion for preemption should be granted and the state law claims dismissed.

Standard of Review

The Supreme Court has issued two decisions that pertain to the standard of review for a motion to dismiss for failure to state a claim upon which relief could be granted under Federal Rule of Civil Procedure 12(b)(6). The Court held that a complaint must include factual allegations that "state a claim to relief that is plausible on its face." Ashcroft v. Iqbal, 556 U.S. 662, 678 (2009) (citing Bell Atl. Corp. v. Twombly, 550 U.S. 544, 570 (2007)). "[W]ithout some factual allegation in the complaint, a claimant cannot satisfy the requirement that he or she provide not only 'fair notice' but also the 'grounds' on which the claim rests." Phillips v. County of Allegheny, 515 F.3d 224, 232 (3d Cir. 2008). In determining whether a plaintiff has met this standard, a court must reject legal conclusions unsupported by factual allegations, "[t]hreadbare recitals of the elements of a cause of action, supported by mere conclusory statements;" "labels and conclusions;" and "'naked assertion[s]' devoid of 'further factual enhancement.'" Iqbal, 556 U.S. at 678 (citations omitted). Mere "possibilities" of misconduct are insufficient. Id. at 679. District courts are required to engage in a two part inquiry:

First, the factual and legal elements of a claim should be separated. The District

Court must accept all of the complaint's well-pleaded facts as true, but may disregard any legal conclusions.... Second, a District Court must then determine whether the facts alleged in the complaint are sufficient to show the plaintiff has a "plausible claim for relief." ... In other words, a complaint must do more than allege the plaintiff's entitlement to relief. A complaint has to "show" such an entitlement with its facts.

Fowler v. UPMC Shadyside, 578 F.3d 203, 210-11 (3d Cir. 2009) (citations omitted).

A motion for judgment on the pleadings under Rule 12(c) is treated in the same manner as a motion to dismiss for failure to state a claim upon which relief may be granted. The court should "accept the truth of all factual allegations in the complaint and must draw all reasonable inferences in favor of the non-movant." Revell v. Port Auth. of NY& NJ, 598 F.3d 128, 134 (3d Cir. 2010) (citing Turbe v. Government of the V.I., 938 F.2d 427, 428 (3d Cir. 1991)).

As the Court of Appeals has explained, the Price-Anderson Act (PAA), as amended in 1988, provides a federal cause of action for "public liability actions," and defines "public liability" as "any legal liability arising out of or resulting from a nuclear incident or precautionary evacuation," except for certain claims covered by workers' compensation, incurred in wartime or that involve the licensed property where the nuclear incident occurs. In re TMI Litig., 193 F.3d 613, 625 & n.9 (3d Cir. 1999) (citing 42 U.S.C. § 2014(w)). The Act defines the term "nuclear incident" as:

any occurrence, including an extraordinary nuclear occurrence ... causing ... bodily injury, sickness, disease, or death, or loss of or damage to property, or loss of use of property, arising out of or resulting from the radioactive, toxic, explosive, or other hazardous properties of source, special nuclear, or byproduct material[.]

42 U.S.C. § 2014(q). "Source material" includes uranium and uranium ore. 42 U.S.C. § 2014(z).

The Act provides that "the substantive rules of decision in [any public liability action]

shall be derived from the law of the State in which the nuclear incident involved occurs, unless such law is inconsistent with the provisions of [the Act].” 42 U.S.C. § 2014(hh). See El Paso Natural Gas Co. v. Neztosie, 526 U.S. 473, 484 n.6 (1999) (noting that the structure of the Act, “in which a public liability action becomes a federal action, but one decided under substantive state-law rules of decision that do not conflict with Price-Anderson Act ... resembles what we have spoken of as ‘complete pre-emption doctrine,’ under which ‘the pre-emptive force of a statute is so “extraordinary” that it converts an ordinary state common-law complaint into one stating a federal claim for purposes of the well-pleaded complaint rule.’” (quoting Caterpillar, Inc. v. Williams, 482 U.S. 386, 393 (1987)). However, the standard of care is defined by the relevant federal nuclear regulations promulgated by the Nuclear Regulatory Commission (NRC). In re TMI Litig. Cases Consolidated II, 940 F.2d 832, 859 (3d Cir. 1991) (“states are preempted from imposing a non-federal duty in tort, because any state duty would infringe upon pervasive federal regulation in the field of nuclear safety, and thus would conflict with federal law.”) Indeed, a “claim growing out of a nuclear incident is compensable under the terms of the Amendments Act or it is not compensable at all.” Id. at 854.

In the TMI case, residents of the area around the Three Mile Island nuclear power plant brought suit alleging that the reactor accident on March 28, 1979 released radiation into the environment, causing them to develop neoplasms (unusual tissue growths). The plaintiffs brought suit under the PAA, the defendants raised Daubert challenges to the plaintiffs’ experts, the district court excluded the overwhelming majority of the proposed experts’ testimony as to dose exposure and the defendants then moved for and obtained summary judgment in their favor.

The Court of Appeals affirmed. 193 F.3d at 722-23.⁴

In an earlier part of the case, the plaintiffs argued that the Third Circuit had left open the question of whether state tort law was preempted. The district court rejected this argument, In re TMI, 904 F. Supp. 379, 382 n.2, 394 (M.D. Pa. 1994), and the Court of Appeals agreed: “TMI II definitively resolved the issue of whether federal law preempts state tort law on the standard of care.” In re TMI, 67 F.3d 1103, 1107 (3d Cir. 1995).⁵ Specifically, the court held that “federal law determines the standard of care and preempts state tort law.” Id.

Other courts have agreed. See In re Hanford Nuclear Reservation Litig., 534 F.3d 986, 1003 (9th Cir. 2008); Roberts v. Florida Power & Light Co., 146 F.3d 1305, 1308 (11th Cir. 1998); Nieman v. NLO, Inc., 108 F.3d 1546, 1552-53 (6th Cir. 1997); O’Conner v. Commonwealth Edison Co., 13 F.3d 1090, 1100 (7th Cir. 1994) (relying on TMI). But see Cook v. Rockwell Int’l Corp., 618 F.3d 1127, 1142-44 & n.19 (10th Cir. 2010) (distinguishing all of these cases on the ground that they relied on field preemption, which the defendants in Cook did not raise, arguing instead conflict preemption).⁶

Defendants contend that all of Plaintiffs’ state law claims are predicated upon a liability

⁴ The court reversed the grant of summary judgment to the defendants as to the claims by the “non-trial plaintiffs” because it did not know what their trial theories would be. Id. at 723-27. However, ultimately, the district court concluded that the non-trial plaintiffs were proceeding with the same theories as the trial plaintiffs and granted summary judgment against them again. The Court of Appeals affirmed. In re TMI Cases Consolidated II, 53 F. App’x 648 (3d Cir. 2002).

⁵ The Court of Appeals reversed the district court’s conclusion that the federal standard was set by federal regulations requiring radiation releases to be “as low as is reasonably achievable” (ALARA), instead holding that the regulations prescribing maximum permissible radiation exposure levels, namely 10 C.F.R. §§ 20.105 and 20.106, controlled.

⁶ Nevertheless, on remand, the district court held that the plaintiffs’ state law claims were preempted based on the doctrine of complete preemption: “a plaintiff who brings a PAA claim may not pursue a freestanding state-law claim based on the same facts.” Cook v. Rockwell Int’l Corp., 13 F. Supp. 3d 1153, 1155 (D. Colo. 2014).

standard that is inconsistent with the PAA. Plaintiffs contend that the Act merely “alters state tort law,” but does not supplant it altogether. However, the case they cite in support of this proposition, Nieman v. NLO, Inc., 108 F.3d 1546, 1552 (6th Cir. 1997), actually held that the plaintiff’s state law claims were preempted and could not stand as separate causes of action. They also cite Rainer v. Union Carbide Corp., 402 F.3d 608 (6th Cir. 2005), to support the contention that state law should determine whether plaintiffs have been injured. But in that case (and several others addressing the issue), the court merely held that, under its prediction of Kentucky law, no tort exists for mere allegations of cellular damage due to radiation when the plaintiffs have no actual sickness and thus no “bodily injury.” It is further noted that, to the extent that Rainer held that state law determines whether the plaintiffs have been injured, it has been criticized. See Dumontier v. Schlumberger Tech. Corp., 543 F.3d 567, 570 (9th Cir. 2008) (“Unlike the Sixth Circuit, we have never relied on state law to interpret ‘bodily injury.’”) Of course, this Court is required to follow Third Circuit precedent, regardless of how the Ninth and Sixth Circuits ultimately resolve this issue.

Plaintiffs suggest that their state law causes of action are consistent with liability under the PAA, but have not specifically explained how this is so. Moreover, as Defendants note, Plaintiffs take the opposite position in their response to the motion for summary judgment on the issue of duty, in which they argue that Defendants “have simply failed to come forward with any factual or legal argument justifying the dismissal of Plaintiffs’ other tort claims, those that do not require that Plaintiffs’ [sic] prove that Defendants breached the standard of care in order to prevail.” (ECF No. 339 at 36.)

Thus, the law is clear that Plaintiffs cannot maintain state law claims in addition to their PAA claims. As a result, the question presented is whether any of the Plaintiffs’ state law claims

are consistent with the PAA. To the extent that they are, they could serve as the standard of care, but to the extent they are not, only the federal regulations can be cited.

Negligence Claims

Plaintiffs allege claims of negligence, which under Pennsylvania law, require a plaintiff to demonstrate that the defendant “owed a duty of care to the plaintiff, the defendant breached that duty, the breach resulted in injury to the plaintiff, and the plaintiff suffered an actual loss or damages.” Martin v. Evans, 711 A.2d 458, 461 (Pa. 1998) (citations omitted). Plaintiffs assert that Defendants owed a number of duties, including a “duty to prevent the discharge of such substances which might harm” the persons, property or economic interests of Plaintiffs (Am. Compl. ¶ 36);⁷ a “duty to warn” (id.); and a “duty to comply with applicable state, federal, and local governmental laws, regulations, and guidelines.” (Id. ¶ 37). But Defendants counter that the only duty of care applicable under the PAA is established by 10 C.F.R. § 20.106, and that any other standard would conflict with the federal one. See Koller v. Pinnacle West Capital Corp., 2007 WL 446357, at *3 (D. Ariz. Feb. 6, 2007) (dismissing state law claims of negligence, loss of consortium and strict liability and allowing the first two claims to proceed under the PAA, but only to the extent that the claims were based on the federal standard of care); TMI, 904 F. Supp. at 382 n.2, 394 (dismissing Pennsylvania negligence claims as preempted).

Defendants have demonstrated that Plaintiffs’ allegation of negligence would import a standard other than § 20.106. Therefore, the negligence claims should be dismissed.

Negligence Per Se

To pursue a negligence per se claim under Pennsylvania law, Plaintiffs must establish a

⁷ ECF No. 83.

breach of a legislative enactment which stands in as the applicable duty of care. Shamnoski v. PG Energy, Div. of S. Union Co., 858 A.2d 589, 601 (Pa. 2004) (negligence per se requires a specific legislative enactment that “leave[s] little question that a person or entity found in violation of it deviated from a reasonable standard of care”). Defendants contend that Plaintiffs’ negligence per se claims list an assortment of federal and state statutes, but only one federal law may be applied in this case to Defendants’ conduct – 10 C.F.R. § 20.106. They argue that, insofar as Plaintiffs’ negligence per se claims would allow any legislative enactment or statutory “duty” other than the federally permissible limits to act as Defendants’ duty of care, it is preempted as inconsistent with the Act. See McClurg v. M.I. Holdings, Inc., 933 F. Supp. 2d 1179, 1187 (E.D. Mo. 2013) (holding that the PAA preempted state law claims, including for negligence per se); Adkins v. Chevron Corp., 960 F. Supp. 2d 761, 768 (E.D. Tenn. 2012) (negligence per se claim preempted in uranium exposure case brought by members of the public); TMI, 904 F. Supp. at 382 n.2, 394 (dismissing Pennsylvania negligence per se claims as preempted). Therefore, the negligence per se claims should be dismissed.

Absolute or Strict Liability

Defendants argue that Plaintiffs’ absolute or strict liability claims are preempted because the very theory of “strict liability is inconsistent with the Price-Anderson Act and is unavailable to Plaintiffs.” O’Connor v. Boeing N. Am., Inc., 2005 WL 6035255, at *43-44 (C.D. Cal. Aug. 18, 2005). Strict liability theories are inconsistent with the Price-Anderson Act because they allow for the establishment of liability “without first establishing that [defendants] breached the federally-imposed permissible dose limits.” Koller, 2007 WL 446357, at *3 (granting motion to dismiss strict liability count); Wilcox v. Homestake Mining Co., 401 F. Supp. 2d 1196, 1201 (D.N.M. 2005) (dismissing absolute and strict liability claims because they were inconsistent

with the PAA); McLandrich v. So. Cal. Edison Co., 942 F. Supp. 457, 465 n.7 (S.D. Cal. 1996) (noting that “applying the ‘ultrahazardous activities’ doctrine here would be clearly inconsistent with the Price-Anderson Act.”); Adkins, 960 F. Supp. 2d at 766, 768 (same in uranium exposure case); TMI, 904 F. Supp. at 382 n.2, 394 (dismissing Pennsylvania strict liability claims as preempted). Therefore, these claims should be dismissed.

Civil Conspiracy

A complaint for civil conspiracy is premised on a combination of people acting “with a common purpose to do an unlawful act or to do a lawful act by unlawful means or for an unlawful purpose,” an overt act, and actual legal damage. McKeeman v. Corestates Bank, N.A., 751 A.2d 655, 660 (Pa. Super. 2000). Defendants argue that Plaintiffs’ state law conspiracy claims allow for the establishment of liability “without first establishing that [Defendants] breached the federally imposed permissible dose limits” and are therefore inconsistent with the PAA. See, e.g., Koller, 2007 WL 446357, at *3. Plaintiffs have not responded to this specific argument. Defendants have demonstrated that civil conspiracy claims would impose liability inconsistent with the PAA. Therefore, these claims should be dismissed.

Misrepresentation and Concealment

Four of the more recent cases (Civ. A. Nos. 13-186, 13-704, 13-1527 and 14-639) also contain a claim for misrepresentation and concealment. Defendants argue that the complaints in these actions attempt to allege the elements of negligent misrepresentation. See Second Am. Compl. Civ. A. No. 13-186 (ECF No. 30) ¶ 64. Negligent misrepresentation requires proof of: (1) a misrepresentation of a material fact; (2) made under circumstances in which the misrepresenter ought to have known of its falsity; (3) with an intent to induce another to act on it; and (4) which results in injury to a party acting in justifiable reliance on the misrepresentation.

Bortz v. Noon, 729 A.2d 555, 561 (Pa. 1999) (citations omitted). “Moreover, like any action in negligence, there must be an existence of a duty owed by one party to another.” Id. at 501.

Defendants contend that this cause of action would also allow them to be held liable without requiring Plaintiffs to show that they breached the federal standard of care in these actions. Because Congress “clearly intended to supplant all possible causes of action when the factual prerequisite of the statute are met,” In re TMI II, 940 F.2d at 857, Plaintiffs cannot maintain a cause of action based on misrepresentation and concealment against Defendants. They also note in their reply brief that Plaintiffs failed to address this cause of action in their response. Therefore, these claims should be dismissed.

Wrongful Death and Survival

Finally, although pled as a separate cause of action, Plaintiffs seek derivative damages pursuant to one or more of their state law claims for the death of a claimant. In paragraph 59, for example, Plaintiffs claim that their “beneficiaries are entitled to recover damages for such wrongful death.” Defendants argue that, because Plaintiffs’ state law claims are preempted by and are inconsistent with the PAA, to the extent that any of Plaintiffs’ claims are derivative of those claims, they must also fail as a matter of law. See, e.g., Roberts, 146 F.3d at 1308 (holding that because plaintiffs failed to allege breach of duty of care, plaintiff’s wife failed to state a cause of action for loss of consortium); Adkins, 960 F. Supp. 2d at 767 (dismissing wrongful death claims as preempted).

Defendants have demonstrated that all of Plaintiffs’ state law claims are preempted by the PAA and that they would impose liability in a manner inconsistent with the standards under the Act. Therefore, the motions for judgment on the pleadings should be granted and the state law claims should be dismissed from all of the cases.

The remaining motions seek summary judgment on various grounds. They will be addressed in the following sequence: 1) the motion for summary judgment on Plaintiffs' failure to establish a breach of duty; and 2) the motion for summary judgment on Plaintiffs' failure to establish exposure and dose.

Summary Judgment Standard of Review

As amended effective December 1, 2010, the Federal Rules of Civil Procedure provide that: "The court shall grant summary judgment if the movant shows that there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law." Fed.R.Civ.P. 56(a). Summary judgment may be granted against a party who fails to adduce facts sufficient to establish the existence of any element essential to that party's case, and for which that party will bear the burden of proof at trial. Celotex Corp. v. Catrett, 477 U.S. 317, 322 (1986). The moving party bears the initial burden of identifying evidence which demonstrates the absence of a genuine issue of material fact. Once that burden has been met, the non moving party must set forth "specific facts showing that there is a genuine issue for trial" or the factual record will be taken as presented by the moving party and judgment will be entered as a matter of law. Matsushita Elec. Indus. Corp. v. Zenith Radio Corp., 475 U.S. 574, 587 (1986). An issue is genuine only if the evidence is such that a reasonable jury could return a verdict for the nonmoving party. Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 248 (1986).

In following this directive, a court must take the facts in the light most favorable to the non-moving party, and must draw all reasonable inferences and resolve all doubts in that party's favor. Hugh v. Butler County Family YMCA, 418 F.3d 265, 266 (3d Cir. 2005); Doe v. County of Centre, Pa., 242 F.3d 437, 446 (3d Cir. 2001).

Breach of Duty

Defendants contend that Plaintiffs have failed to raise a genuine issue for trial on the issue of breach of duty because they have not proffered evidence that the average annual federal permissible release limits for uranium were ever exceeded. Plaintiffs respond that this Court (in denying Defendants' Daubert motions) and the Hall court have both repeatedly rejected this argument. They also note that Defendants are utilizing the limit applicable for insoluble releases of uranium, but because the facility also released other radionuclides to the air (including particularly Plutonium-239), the applicable limit (the one for the radionuclide in the mixture having the lowest concentration limit) is much lower and was clearly exceeded. They argue that Defendants treat the roof of the Apollo plant as a "restricted area" but that the evidence raises genuine issues of fact about whether it was a restricted area, and if it was an unrestricted area, the concentrations would unquestionably have been too high. Finally, they contend that Defendants misapply the regulation by measuring the amount at the boundary rather than at the stacks themselves.

In a reply brief, Defendants reiterate that the measurement was properly made at the facility's boundary (and the roof was a restricted area), not at the stacks (and thus, records of uranium concentrations at the stacks above the Appendix B limits are immaterial), that Plaintiffs have presented only short-term examples of the concentrations exceeding limits, not average annual amounts as required by the Regulation, and that alleged violations not involving airborne uranium are irrelevant. They note that this Court was not called upon to rule on the issue of whether Plaintiffs' expert's opinion was sufficient previously, but only to determine whether his opinion "fit" the issue of causation. Finally, they contend that, in the Hall case, Judge Ambrose erroneously interpreted ambiguous trial testimony as addressing violations of § 20.106 when it was actually discussing releases of effluent at the stacks within the restricted area.

Standard for Breach of Duty

In TMI, the Court of Appeals held that, to maintain a claim under the PAA, the plaintiffs had to show that:

(1) the defendants released radiation into the environment in excess of the levels permitted by federal regulations in effect in 1979, i.e., 0.5 rem (500 mrem) or 5 mSv; (2) the plaintiffs were exposed to this radiation (although not necessarily at levels prohibited by those regulations); (3) the plaintiffs have injuries; and (4) radiation was the cause of those injuries. We have also held that the “exposure element requires that plaintiffs demonstrate they have been exposed to a greater extent than anyone else, i.e., that their exposure levels exceeded the normal background level.”

193 F.3d at 659 (citing In re TMI, 67 F.3d at 1119). The defendants in TMI conceded that they violated § 20.106; therefore “they violated their duty of care, thus satisfying the first and second elements of a negligence action.” 67 F.3d at 1118 (footnote and citation omitted). Defendants herein have not made this concession, but vigorously contest that they violated § 20.106.

The Atomic Energy Act of 1946 established the Atomic Energy Commission (AEC) to manage the nation’s nuclear energy program. In 1954, Congress amended the Act to authorize the AEC to license private companies for nuclear fuel production and to issue regulations that would protect the public’s health and safety from radiation hazards related to those activities. In 1957, the same year that NUMEC received a license for nuclear fuel fabrication at the Apollo facility, the AEC adopted regulatory “Standards for Protection against Radiation” as Part 20 of 10 C.F.R. Chapter 1. (Knapp Decl. ¶ 7.)⁸ The regulatory standard applicable to the emission of radionuclides in airborne effluent to off-site areas where they may be inhaled by members of the public during the period when the Apollo facility operated (1957-1983) was 10 C.F.R. § 20.106,

⁸ Defs.’ App. (ECF No. 334) Ex. 1.

“Radioactivity in effluents to unrestricted areas.” It provided that:

[N]o licensee shall . . . release into air or water in any unrestricted area any concentration of radioactive material in excess of the limits specified in Appendix B, Table II of this part. For purposes of this paragraph, concentrations may be averaged over periods not greater than one year.⁹

Appendix B, Table II of Part 20 specified numeric concentration limits for more than a hundred different radioisotopes, including uranium, in airborne effluent.

Defendants aver that those numeric limits were set in accordance with expert scientific advice on the air concentration of the radionuclide that can be inhaled by an individual continuously – 24 hours/day for 365 days/year – without resulting in a dose of 0.5 rem of radiation, thus providing “a conservative standard of safety.” See *Miscellaneous Amendments*, 25 Fed. Reg. 8595, 8595 (Sept. 7, 1960).¹⁰ The limits, although protective of health, permit sustained releases at low concentrations. The regulation represents “the considered judgment of the relevant regulatory bodies—the Federal Radiation Council, EPA, AEC, and NRC—on the appropriate levels of radiation to which the general public may be exposed.” *In re TMI*, 67 F.3d at 1113-14 (footnote and citation omitted).¹¹

During 1957-60, a period in which the Apollo facility was in start-up mode, the Appendix

⁹ The regulation was issued in 1957 and remained in effect through 1983 when the Apollo facility was closed. From 1957 to 1961, the regulation was numbered § 20.103; it was renumbered § 20.106 in 1961. The cited language is from the 1957 and 1961 versions. See Part 20—Standards for Protection Against Radiation, 22 Fed. Reg. 548, 551 (Jan. 29, 1957) (Defs.’ App. Ex. 4) (publishing § 20.103(b)); Part 20—Standards for Protection Against Radiation, 25 Fed. Reg. 10914, 10917 (Nov. 17, 1960) (Defs.’ App. Ex. 6) (publishing 10 C.F.R. § 20.106(b)). The language was slightly revised in 1964. Radioactivity in Effluents to Unrestricted Areas, 29 Fed. Reg. 14434, 14434 (Oct. 21, 1964) (Defs.’ App. Ex. 7).

¹⁰ Defs.’ App. Ex. 5; Knapp Decl. ¶¶ 7-9.

¹¹ In 1974, Congress abolished the AEC and transferred its licensing and related regulatory functions to the NRC. Energy Reorganization Act of 1974, Pub. L. No. 93-438, §§ 104(A), 201(F), 88 Stat. 1233, 1237, 1243 (codified at 42 U.S.C. §§ 5814(a), 5841(f)). See *In re TMI*, 67 F.3d at 1112 n.20.

B, Table II limit for any isotope of uranium was 1.7×10^{-12} microcuries of radioactivity per milliliter of air. (Knapp Decl. ¶ 13.) See 22 Fed. Reg. at 554 (publishing Appendix B, n.3).¹² Beginning in 1961, the limit for the primary isotopes of uranium was 4×10^{-12} microcuries/milliliter for U-234 or U-235 in insoluble form, and 20×10^{-12} microcuries/milliliter for U-234 or U-235 in soluble form. (Knapp Decl. ¶ 13).¹³

The term “unrestricted area” in Section 20.106 is defined as an area “access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials.” 10 C.F.R. § 20.3(17) (1967) (Knapp Decl. ¶ 10.) By contrast, a restricted area “means any area access to which is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, and any area used for residential quarters.” 10 C.F.R. § 20.3(14) (1967).¹⁴ In re TMI, 67 F.3d at 1108 nn.12-13. The court noted that § 20.106 limits “were intended to cover persons outside a nuclear plant’s boundaries, i.e., the general public.” Id. at 1114.

The 1957 and 1961 versions of Section 20.106 provided that the determination of the average concentration of radioactive material in a facility’s effluent relative to the Appendix B, Table II limits “shall be made with respect to the point where such material leaves the restricted area.” See 22 Fed. Reg. at 551 (publishing § 20.103(c)); 25 Fed. Reg. at 10917 (publishing

¹² Defs.’ App. Ex. 4.

¹³ Natural and enriched uranium is composed of a mixture of three uranium isotopes, U-238, U-234 and U-235. In re TMI Litig., 193 F.3d at 645 n.54. See Knapp Decl. at 5 n.3. Somewhat oddly and inaccurately, Plaintiffs claim that Defendants utilize the U-238 limits (ECF No. 339 at 2-3). However, U-238 makes only a minor contribution. Appendix B, Table II limits for U-238 in 1964 were 5×10^{-12} microcuries/milliliter for insoluble uranium and 3×10^{-12} microcuries/milliliter for soluble uranium.

¹⁴ Defs.’ App. Ex. 8.

§ 20.106(c)).¹⁵ The 1964 revision reiterated that the concentration limits apply at the location where material leaves the restricted area, and added language in § 20.106(d) clarifying the standard for a facility that discharges effluent through smokestacks located within its restricted premises:

For the purposes of this section the concentration limits in Appendix “B”, Table II of this part shall apply at the boundary of the restricted area. The concentration of radioactive material discharged through a stack, pipe or similar conduit may be determined with respect to the point where the material leaves the conduit. If the conduit discharges within the restricted area, the concentration at the boundary may be determined by applying appropriate factors for dilution, dispersion, or decay between the point of discharge and the boundary.

Radioactivity in Effluents to Unrestricted Areas, 29 Fed. Reg. at 14434-14435.¹⁶

Defendants maintain that the first sentence of Section 20.106(d) explicitly recognizes that the facility’s boundary alone is where average emission concentration limits apply and that the third sentence distinguishes between two different locations: (a) the “point of discharge” of a stack or similar conduit discharging within a restricted area, and (b) “the boundary” at which concentration limits apply. Facilities may measure concentrations at point “a” and then apply appropriate factors for dilution, dispersion or decay in order to calculate concentrations at point “b,” where limits apply. (Knapp Decl. ¶ 12.) Defendants state that substantial dilution occurs between a stack and a roof perimeter because material emitted from a stack is mixed into a much larger volume of air flowing over the stacks. (Knapp Decl. ¶¶ 12, 20, 28.) They note that the AEC recognized this fact when, in 1969, it granted NUMEC a license to release effluent at individual stacks at up to 100 times the Appendix B limit, so long as concentration limits were

¹⁵ Defs.’ App. Exs. 4, 6.

¹⁶ Defs.’ App. Ex. 7.

met at the boundaries. (Defs.' App. Ex. 34.)

Plaintiffs note that the second sentence of § 20.106(d) indicates that the “concentration of radioactive material discharged through a stack, pipe or similar conduit may be determined with respect to the point where the material leaves the conduit.” They argue that there are issues of fact as to whether the point where the material left the conduit was in a restricted area or not and that Defendants cannot utilize the “appropriate factors” language from the third sentence in any event because they did not do so during the facility’s period of operation.

Defendants note that § 20.106 at all times provided that the concentration limits specified in Appendix B, Table II of Part 20 applied to concentrations averaged for periods up to one year. See, e.g., 10 C.F.R. § 20.106(a) (1967).¹⁷ They contend that averaging values over a year makes sense in light of the AEC’s adoption of concentration values in Appendix B considered safe even if inhaled continuously 24 hours a day for an entire year. Thus, even if the average concentration at the boundary on a particular day or series of days exceeded the limits set forth in Appendix B, the licensee would still be in compliance with Section 20.106 so long as the average concentration over a period up to a year was below that level. The Court of Appeals held in TMI that “the duty of care is measured by whether defendants released radiation in excess of the levels permitted by §§ 20.105 and 20.106, as measured at the boundary of the facility....” 67 F.3d at 1117.¹⁸

¹⁷ Defs.’ App. Ex. 8. Since 1991, 10 C.F.R. §§ 20.105 and 20.106 no longer exist. The current regulation requires licensees to conduct operations so that “[t]he total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rems (1 millisievert) in a year” 10 C.F.R. § 20.1301 (2002). “Rather than bar release of radiation above a certain amount, the regulations bar *exposure* above a specified amount.” Good v. Fluor Daniel Corp., 222 F. Supp. 2d 1236, 1248 (E.D. Wash. 2002).

¹⁸ As explained below, § 20.105 is inapplicable in this case.

Facts as to Breach of Duty

In the operative complaint, each plaintiff asserts claims under the Price Anderson Act, alleging injury through inhalation of uranium released into the air, in violation of federal regulations, by the former nuclear fuels facility located in Apollo, Pennsylvania during the period of its operation, 1957-1983. (ECF No. 83 ¶¶ 1, 2, 12-28.) Defendants indicate that, in the course of the facility's operations, uranium effluent was discharged through vents and stacks that opened onto its rooftop, at varying distances from the roof perimeter. (Defs.' App. Ex. 26.) Plaintiffs indicate that, in addition, they have evidence that the plant released material through the use of incinerators, sides of the facility and other uncontrolled/accidental processes. (Ring Rpt. at 9-13.)¹⁹

Operations involving the production of nuclear fuel from uranium began at the Apollo facility on a small scale late in 1957, expanded in the 1960s, and continued to 1983. (Defs.' App. Ex. 38.) Operations were conducted in a two-story facility building. (*Id.* at 7.) Work areas within the building not exposed to uranium dust or gases were ventilated through unfiltered roof vents or small stacks opening onto the roof. (Defs.' App. Exs. 16-18.) Production processes and areas involving uranium dust or gases were vented through other stacks fitted with high-efficiency filters or chemical scrubbers which removed most radioactivity from the effluent. (Defs.' App. Exs. 17, 36.) Those stacks also opened onto the roof. (Defs.' App. Ex. 26.)

Despite the high-efficiency filters and scrubbers, it was recognized that stack emissions contained some amounts of radioactive uranium released to the outdoor air. (Knapp Decl. ¶ 20.) Effluent containing uranium discharged from the stacks was subject to dilution as it mixed with

¹⁹ Pls.' App. (ECF No. 347) Ex. 61.

ambient air and to dispersion as it was borne by the wind to the roof's perimeter and beyond.
(Defs.' App. Ex. 31.)

The Apollo nuclear facility was physically attached to a local metal services business (called "Raychord") and shared three common walls with that business. (Pls.' App. Ex. 4 at 1.) The stacks on the Apollo building were not tall smoke-stacks – most did not reach above the peak of the roof. (Pls.' App. Ex. 4 at 3.)²⁰

The Apollo nuclear plant was also unusual because it was located in a building directly across the street from small businesses and a residential neighborhood. Former NUMEC health and safety director Roger Caldwell wrote in 1966 that "Houses crowd in as close as 200 feet and several hundred people live within a thousand yard half circle of the plant." (Pls.' App. Ex. 4 at 1.) Another former health and safety director at NUMEC testified that the Apollo nuclear facility was the only nuclear facility located across the street from a neighborhood. (Reitler Dep. at 57-59 (agreeing that Apollo facility was unique in its proximity to the public, although one other facility was close to an industrial area).²¹

Defendants respond that the AEC knew and approved of the Apollo facility's location. See, e.g., Pls.' App. Ex. 5 (showing "Residential Area" on the map); Defs.' App. Ex. 25 (renewed license). They argue that the proximity of occupied premises to the boundary of the Apollo facility's restricted area is immaterial.

Defendants state that Plaintiffs' expert, Bernd Franke, admitted that the boundary of the facility's restricted area (as defined in 10 C.F.R. Part 20) was at or beyond the perimeter of its

²⁰ Plaintiffs contend that the roof fans were "essentially flush with the top of the roof," but Defendants note that their references (Pls.' App. Ex. 6 at 4, Ex. 36) do not support this assertion.

²¹ Pls.' App. Ex. 19.

roof. (Jan. 7, 2013 Franke Dep. at 131:2-12, 195:25-198:4, 199:18-200:4, 201:3-13.)²² Plaintiffs contend that the roof of the Apollo facility was an unrestricted area. Moreover, Plaintiffs do not agree that this fact is material to the issues in this case because the point-of-discharge at the stacks is the place where compliance is to be measured in cases, like this, where dispersion analysis was not conducted during facility operations. These issues are discussed below.

Defendants contend that Plaintiffs have not identified any evidence showing that the concentration of uranium effluent at the boundary of the facility, or at any point beyond the boundary, as averaged over a particular year, exceeded 1.7×10^{-12} microcuries/milliliter during the period 1957-1960, or that it exceeded 4.0×10^{-12} microcuries/milliliter during the period 1961-1983. Each time the AEC inspected the facility, regulators determined that emissions were within applicable annual concentration limits. (Knapp Decl. ¶ 21.)

Beginning in 1966, air sampling and monitoring was conducted at the facility roof edge. Four monitors were placed in four compass directions around the roof edge. In addition to these roof edge monitors, other monitors were placed in nearby locations around the facility's building. One off-site monitor was placed to the north, near the abutting office of the neighboring plant. A second was placed to the east at an office building owned by NUMEC across the road from its facility building. A third was placed about 100 meters to the southwest at a nearby building called the "NDC." Information regarding the roof edge and offsite monitors and their positioning was provided by NUMEC to the AEC, and the AEC indicated that it considered the roof edge sampling results, backed up by the off-site monitoring, to represent the concentrations of effluent released to unrestricted areas. At various times, offsite monitors also were operated at other locations. About May 1972, the number of roof edge monitors was increased to ten.

(Whipple Decl. ¶ 3²³; see also Defs.' App. Ex. 35.)

Defendants note that, from 1966 to 1980, the roof-edge monitors recorded the

²² Defs.' App. Ex. 10.

²³ Defs.' App. Ex. 3.

concentration of radioactivity in airborne effluent. The average annual concentration of uranium measured at each roof perimeter monitor was below 4×10^{-12} microcuries/milliliter in each of those years. (Whipple Decl. ¶¶ 3-4, 7 & Table 1.) Concentrations at nearby offsite locations were even lower. (Whipple Decl. ¶ 5 & Table 2.) See also Defs.' App. Ex. 31.²⁴

Defendants note that, in 1966, the AEC determined that the concentrations of effluents in releases from the facility to unrestricted areas were in compliance with AEC requirements, that the facility's production as conducted at the time did not differ from that conducted in the past, and that the facility's releases of uranium occurring during past operations were probably also in compliance. (Defs.' App. Ex. 26 at PDR-04-2470, 2473, 2478-80.) In reaching that conclusion, the AEC examined (a) average concentrations rather than daily concentrations and (b) concentrations at the roof perimeter rather than at stacks. (Id. at PDR-04-2478-79.) The AEC found that most of the stacks were discharging uranium at concentrations above the Appendix B limit and that on certain days that limit was exceeded even at the roof perimeter. (Id.) Nevertheless, it determined that the facility was in compliance with Section 20.106 because the average roof perimeter concentrations of uranium were within applicable limits. (Id. at 4; Knapp Decl. ¶ 22.)

The AEC conducted a second comprehensive review of boundary emission concentrations in 1969 in connection with its consideration, and ultimate approval, of the Apollo facility's program to verify boundary concentration by continuous, direct monitoring of radioactivity at the boundary as well as at nearby points beyond the facility's restricted area.

²⁴ These original records reported concentrations of radioactivity in units of disintegrations per minute (dpm). The amount 2.2 dpm per cubic meter is equivalent to 1×10^{-12} microcuries per milliliter and the annual limit would thus be 8.8 dpm/m³. (Whipple Decl. ¶ 6.)

NUMEC installed the monitoring system in 1966, and over the next three years gathered and shared with AEC data on boundary and nearby off-site concentrations under all operating conditions, all weather conditions, and in all directions. See Mar. 5, 1969 NUMEC Letter at 5-9 (enclosing wind rose, diffusion graph, and roof edge and environmental sampling data;²⁵ May 26, 1969 AEC Letter, at 5-9 (enclosing same²⁶). The data showed that the annual average concentrations of uranium at the boundaries were well within the Appendix B limits and that the concentrations at nearby off-site locations were far lower. See May 26, 1969 AEC Letter, at 6-9; Whipple Decl. ¶¶ 4-5, Tables 1 and 2. On May 26, 1969, having considered three years of monitoring data, the AEC formally granted NUMEC's requested license amendment authorizing the roof perimeter/off-site monitoring-based verification method. See May 26, 1969 AEC Letter at 1-2. The AEC endorsed the roof perimeter monitoring as yielding results "adequately representative of the concentrations released to unrestricted areas" for purposes of determining compliance with Section 20.106. (*Id.* at 2.) Off-site monitors were to provide a second level of assurance against releases to unrestricted areas in excess of the limits. (*Id.* at 1-2.)

Defendants further note that, in 1995, the NRC conducted a retrospective review of the facility's releases of uranium to unrestricted areas, in response to complaints from residents of a nearby community, and determined that releases from the facility were within 10 C.F.R. Part 20 requirements and within regulatory limits, including Section 20.106. (Knapp Decl. ¶ 23.) This result was published in the Federal Register, 1995 NRC Director's Decision, 60 Fed. Reg. 35571, 35572-73 (July 10, 1995).²⁷ In reaching this conclusion, the Director explained that

²⁵ Defs.' App. Ex. 31.

²⁶ Defs.' App. Ex. 34.

²⁷ Defs.' App. Ex. 37.

“values set forth in 10 CFR Part 20, Appendix B, Table II, are the regulatory limits applicable at the site boundary, not at the stacks.” (Id. at 35573 n.8.)

Plaintiffs argue that these agency findings “relied wholly upon representations from NUMEC” that the agencies “never verified” the underlying facts. However, there is no support for the contention that a facility cannot demonstrate compliance with § 20.106 limits using its own monitoring data or that the agency evaluations were less than complete. Nor are they undermined by a 2008 NIOSH report (cited below) prepared in connection with proceedings to allow former workers to qualify for benefits based on work history at Apollo.

Plaintiffs cite their expert, Bernd Franke, who has opined that: “stack effluent concentrations exceeded [NUMEC’s] license requirements in all years between 1963 and 1973.” (Franke & Makhijani Rpt. at 27; see also Franke Aff. at 2.²⁸) Defendants respond that Franke did not opine that airborne releases from the Apollo facility exceeded 10 C.F.R. § 20.106 and Appendix B limits. Rather, his opinion as stated in the cited document relates to concentrations that purportedly exceeded “license requirements.” He opines that certain individual stack concentrations exceeded license requirements in the years 1963-73; no such opinion is given for the years 1958-62 or 1974-83. More importantly, they note that his opinion relates to concentrations at the stacks opening onto the restricted rooftop, not annual concentrations at the Apollo facility’s boundaries. In fact, Mr. Franke’s report acknowledges that, for most of the years during which the facility operated, offsite monitors showed average concentrations well below § 20.106 limits. (Franke & Makhijani Rpt. at 33, Table 5.)²⁹ And Defendants argue that Mr. Franke’s finding that a February 1963 vault fire might have exposed members of the public

²⁸ Pls.’ App. Ex. 31.

²⁹ Defs.’ App. Ex. 12.

who were present to a “lung dose” of in excess of 1.5 rem of radiation (Franke Prelim. Decl. ¶ 7)³⁰ is irrelevant because neither § 20.105 nor § 20.106 contains such limits and Mr. Franke made no attempt to connect his hypothetical scenario calculation to any plaintiff in this case. (May 29, 2012 Franke Dep. at 69:25-70:8, 83:5-19, 130:5-18.)³¹ Plaintiffs have not responded to this argument.

Plaintiffs contend that, in November, 1963, health and safety technician Roger Caldwell informed his supervisor that recent amendments to § 20.106 would permit licensees to release concentrations of radioactive material higher than the Appendix B limits, “provided it can be proved that individuals will not be exposed to concentrations higher than those in Appendix B.” He then described for his supervisor the kinds of information that must be supplied to the AEC in an application to release limits higher than those in Appendix B from the stacks. Caldwell concluded by stating that “There is nothing in the proposed amendment to object to.... [I]n truth, the change in 20.106 gives us additional freedom.” (Pls.’ App. Ex. 49.)

Defendants respond that Plaintiffs mischaracterize the cited document. The document discusses an amendment that would permit a licensee to request special permission to exceed Appendix B limits at a facility’s boundary, not at its stacks. See also Radioactivity in Effluents to Unrestricted Areas, 29 Fed. Reg. 14434, 14434 (Oct. 21, 1964).³²

In March, 1964, Eber Price of the AEC wrote to NUMEC president Zalman Shapiro, informing him that NUMEC would be cited for failing to conduct surveys necessary to “determine compliance with 10 C.F.R. § 20.106(b)” as required by § 20.201. Therefore, Price

³⁰ Defs.’ App. Ex. 11.

³¹ Defs.’ App. Ex. 9.

³² Defs.’ App. Ex. 7.

concluded that, based on NUMEC's "records of airborne concentrations of radioactive materials discharged from your effluent stacks during 1963, it appears that the concentrations released to unrestricted areas may have exceeded the limits set forth in 10 C.F.R. 20.106(b)." (Pls.' App. Ex. 50.)

Defendants respond that Plaintiffs mischaracterize the cited document. The AEC did not inform NUMEC that it would be cited for failing to conduct surveys. The document does not state that the AEC had found NUMEC in violation of 10 C.F.R. § 20.106. The document concerns the means by which NUMEC would verify compliance with 10 C.F.R. § 20.106 at the Apollo facility's boundaries.

On April 20, 1964, E.V. Barry, NUMEC's Manager, Health and Safety, informed Price that NUMEC would apply to obtain permission to exceed the Appendix B limits at the stack (provided in § 20.106(b)), and had conducted some diffusion and dispersion analysis to support such a request. (Pls.' App. Ex. 16.) Plaintiffs argue that the necessary implication of Barry's request for permission to exceed the limitations when measured at the stack is that NUMEC was not permitted to exceed those Appendix B limits without such authorization.

Defendants respond that Plaintiffs mischaracterize the cited document. The cited document does not reference an application to exceed Appendix B limits at the stacks.

In the same letter to the AEC, Barry stated that:

the average yearly concentrations at our property line when the winds are from the east quadrant are at or below the permissible concentrations in unrestricted areas in six of the ten sections, while the concentrations in the remaining four sections exceed the permissible concentrations in unrestricted area by factors as high as 5. . . the average yearly concentrations at our property line when the winds are from the south quadrant exceed the concentration for an unrestricted area by a factor of approximately 4.5 with 3.71 being caused by 3 stacks.

(Pls.' App. Ex. 16 at 4.) Barry wrote that: "The area to the west of our property line, while in the

legal sense is an unrestricted area, it is somewhat restricted since this area is almost entirely rooftop area owned by the Raychord Corporation.” (Id.) He concluded that:

[W]e find that the yearly average concentration at our east and south property line does not exceed the concentration permitted in unrestricted areas. The area to the east is a truly unrestricted area. Further, although the area to the west is legally an unrestricted area, we feel that in reality, it is a restricted area because of the large roof area.

The Raychord office building immediately to the north poses the only serious potential hazard; but with knowledge of plant operations, the hazard at our northern property line is minimal.

(Id.)

On June 5, 1964, Price responded to Barry’s request by stating that:

We do not believe the roof area of the Raychord facility to can be a restricted area as defined in paragraph 20.3(a)(14). Further, the roof area of the NUMEC facility is an unrestricted area unless access to this area is controlled from the radiation safety standpoint. If you consider the roof of your facility as a restricted area, please describe (a) the physical barriers ... which render it as such and/or (b) the administrative ... used to control access to the area.

(Pls.’ App. Ex. 37 at 2 ¶ 6.)³³ Price’s reply stated that until NUMEC conducted the necessary sampling and diffusion analysis to affirmatively demonstrate compliance with the § 20.106 limits, the excessive stack releases meant that the company was not in compliance with the rules:

If you cannot demonstrate compliance with 10 C.F.R. § 20.106(b) by means of your air sampling program and/or valid diffusion calculations, it will be necessary for you to a) reduce the concentration of radioactive materials which are released to unrestricted areas or b) apply for special approval for higher concentrations pursuant to 10 C.F.R. § 20.106(a).

(Id. at 3.)

On July 3, 1964, Barry responded as follows:

³³ Plaintiffs occasionally cite their Exhibit 51, which is a duplicate of the same document as Exhibit 37.

We realize that although the Raychord roof is, legally, an unrestricted area that in reality it is a restricted area by virtue of its extremely limited occupancy and because several of the roofs have 30° slopes. Certainly, it is more restricted than say the sidewalk in front of NUMEC's office building.

The same is true of NUMEC's roof. There are no outside ladders on NUMEC's property. We have two inside ladders with normally closed and locked hatches at the top. The only time a hatch is open is when a Health and Safety man is taking air samples on the roof or when a maintenance man is installing stacks, rigging electrical outlets, etc. Only on rare occasions do we have non-NUMEC personnel on our roof. One occasion when this happened is when the local power company installed a set of pole transformers.

(Pls.' App. Ex. 17 at 2-3 ¶ 6.) Barry also stated that predicted concentrations at NUMEC's northern property line based upon the 1963 stack emissions data were 22.4×10^{-12} microcuries per millimeter. (Pls.' App. Ex. 17.) Defendants note that the letters do not state that actual concentrations at any location were 22.4×10^{-12} microcuries per millimeter. Rather, the July 3, 1964 letter and the April 20, 1964 letter referenced within described hypothetical projections and were not based on actual conditions.

Plaintiffs note that Barry followed Price's directive, and applied for special approval to exceed the § 20.106 limits. (Pls.' App. Ex. 17.) Defendants respond the cited document does not request special approval to exceed § 20.106 limits.

Plaintiffs state that, on October 7, 1965, NUMEC was again cited for failing to conduct surveys sufficient to demonstrate compliance with § 20.106, with the result that releases may have exceeded § 20.106 in the community. (Pls.' App. Ex. 52.) Defendants contend that Plaintiffs misconstrue the letter and that they neglect to mention that, on October 27, 1965, NUMEC Vice President Frederick Forscher responded that the facility would replace the previous "survey" program extrapolating from measurements at the stack with a program directly measuring concentrations at the roof edge and at off-site locations:

[W]e intend to replace the statistical sampling of our effluent stacks with a continuous environmental air sampling program . . . at locations at the edge of our roof and at locations beyond the site boundary. We believe this system will provide a more meaningful assessment of the exposure of individuals in unrestricted areas. This system will be in operations by January 1, 1966. A license amendment to this effect will be filed by November 15, 1965.

(Defs.' Reply App. Ex. 1 at 2.)³⁴ Defendants note that the license amendment was submitted on November 15, 1965, as promised. (Defs.' App. Ex. 22.) On November 17, 1965, the AEC thanked NUMEC for its cooperation, and the matter was dropped. (Defs.' Reply App. Ex. 2.) They state that there is no evidence in these documents that the AEC ever concluded that NUMEC had violated the annual concentration limits in § 20.106, Appendix B.

On November 11, 1965, Caldwell wrote an internal memorandum to his supervisor noting that exhaust from the roof fans averaged 110 disintegrations per minute per cubic meter in 1965. (Pls.' App. Ex. 17A at 4.) Plaintiffs contend that the roof fans were located on the roof edge, but cite no evidence in support of this statement. Defendants respond that the letter reports roof fan exhaust data for an unstated period and that the roof fans were not located on the roof edge. See Pls.' App. Ex. 7 (depicting roof fans near the center of the Apollo facility roof). Moreover, Plaintiffs' statement refers to concentrations within the restricted area, not annual concentrations at the Apollo facility's boundaries.

In 1966, Caldwell conducted an environmental and roof edge monitoring study intended to demonstrate to the AEC that even if NUMEC exceeded 10 C.F.R. § 20.106's maximum permissible concentrations (MPC) at the stack, boundary line concentrations would still fall within regulatory limits. Data generated during this study revealed that average air

³⁴ ECF No. 355.

concentrations at the northern roof edge (Location R-1) exceeded that MPC during at least four months in 1967, while the highest concentrations emitted exceeded the MPC in every month but two. (Pls.' App. Ex. 18.)

Defendants respond that the purpose of the study was to show that the concentrations released beyond the roof edge to off-site areas met Appendix B limits. See Pls.' App. Ex. 18 at BW1700001414 ("Every nuclear plant must demonstrate permissible radioactivity concentrations beyond its site boundaries Evaluating off site concentrations at NUMEC's uranium plant provided difficult, but also quite necessary.") The cited data relating to concentrations at Location R-1 refer to concentrations for short periods, not annual concentrations at the Apollo facility's boundaries. In fact, the data showed that 10 C.F.R. § 20.106 and Appendix B limits, averaged annually, were met at the facility's boundary. (Pls.' App. Ex. 18 at BW1700001404; see also Whipple Decl. ¶ 7, Table 1.)

Plaintiffs state that the roof edge monitors underestimated concentrations, as noted by Edward Reitler, formerly NUMEC's highest ranking health and safety official. (Reitler Dep. at 81:9-19; 158-60 & Ex. 12³⁵) (without continuous air monitoring, you would be "lucky" to detect large accidental releases). Reitler testified in his deposition that roof edge monitors were likely to miss accidental releases. In addition, he said that they could even miss routine releases if the wind directed the plume between the roof edge monitors; NUMEC simply had to assume that the monitors were placed in locations that were likely to record emissions on a representative basis. (Reitler Dep. at 127-32, 160-65, 242-47) (atmospheric dispersion and wind direction may cause a plume to miss roof edge monitors). Reitler testified in his deposition that even though stack

³⁵ Pls.' App. Ex. 20.

emissions in 1970 were twice as great as 1968 emissions, the roof edge monitors reflected virtually no change between 1968 and 1970. (Reitler Dep. at 160-65 & Ex. 12.)

Defendants respond that Plaintiffs have mischaracterized the deposition testimony. Reitler was discussing stack monitoring, not roof edge monitoring. (Reitler Dep. at 158-60.) He did not testify that the average annual concentrations at the Apollo facility's boundaries had exceeded 10 C.F.R. § 20.106 and Appendix B limits or that they were not adequately representative of concentrations released to unrestricted areas.

Sylvester Weber observed that NUMEC's sampling program was insufficient to detect accidental releases. (Weber Dep. at 98; Weber Dep. Ex. 6, at 3, Question 5.)³⁶ Defendants respond that Plaintiffs have mischaracterized the deposition testimony. The cited documents do not relate to roof edge monitoring, but rather to stack monitoring. Weber did not testify that the average annual concentrations at the Apollo facility's boundaries had exceeded 10 C.F.R. § 20.106 and Appendix B limits or that they were not adequately representative of concentrations released to unrestricted areas.

Plaintiffs' expert, Mr. Franke, relied upon work by Mathias Rau, who also concluded that the roof edge monitors were likely to miss significant releases from the stacks. (Pls.' App. Ex. 6 at 24-25.) Defendants respond that Plaintiffs' statement refers to concentrations for short periods, not annual concentrations at the Apollo facility's boundaries. Franke has not opined that airborne releases at the Apollo facility exceeded 10 C.F.R. § 20.106 and Appendix B limits.

In a February, 1966, letter to Dale Smith of the AEC, Caldwell wrote that:

we regard the roof area as an [sic] unrestricted area. There are no outside ladders.

³⁶ Pls.' App. Exs. 21, 22.

The only access to the roof is by an inside ladder from the controlled area. The roof hatch is kept locked with keys in the possession of the health and safety technician. Consequently, the roof edge air samplers are measuring directly the concentration being discharged to unrestricted areas.

(Pls.' App. Ex. 38 at 1¶ II.) Although Plaintiffs cite this document to support the claim that the roof was an unrestricted area, the context reveals that the word "unrestricted" was a typographical error, and that what was intended was the word "restricted." Defendants also note that Mr. Franke testified that "the stacks are in the restricted area." (Jan. 7, 2013 Franke Dep. at 173:1.)

Plaintiffs cite a letter in which the term "unrestricted area" is defined as "any area to which access is not controlled by lock, receptionist or guard." (Pls.' App. Ex. 35.) Defendants respond that the term is defined in 10 C.F.R. § 20.3(17) and note that both the AEC and the NRC regarded the NUMEC roof as a restricted area.

Plaintiffs cite handwritten notes dated October 24, 1967, in which NUMEC employee Ronald Crosby noted that "the roof is classified as an unrestricted area." (Pls.' App. Ex. 39.) Defendants respond that the cited document refers to "smear" samples and to limits on the radioactivity in settled residue, not air concentrations, and reports one employee's personal opinion that was never adopted by NUMEC or the AEC.

Plaintiffs contend that Dr. Ring testified as a radiation safety officer, "I would presume things like the roof, et cetera, generally could become unrestricted." (June 9, 2012 Ring Dep. at 153-54.)³⁷ Defendants respond that Dr. Ring's full testimony on this issue was as follows:

Q: So for purposes of your report, with 20.106 in mind and the phrase "restricted area" that we talked about earlier, did you make an attempt to specifically define

³⁷ Pls.' App. Ex. 40.

the boundaries of the restricted area for Apollo during the time it operated?

A: No, I did not. I would presume things like the roof, et cetera, generally could be unrestricted.

Q: But could they also be within the restricted area?

A: They could be, depending upon how they're managed.

(Id. at 153:1-12.) Defendants also note that Plaintiffs suggest that Dr. Ring is ready to testify to § 20.106 violations, alluding to references in his report to “large-scale releases of ionizing radiation into the surrounding neighborhoods,” “violations of federal regulations,” and “frequent unlawful emissions well above federal regulatory limits in unrestricted areas.” (Pls.’ Br. at 34³⁸ (citing Ring Rpt. at 5-7.) But in sworn deposition testimony, Dr. Ring made it clear that he has no opinion that Appendix B limits, averaged over a year, were ever exceeded:

Q: . . . [Y]ou don’t have an opinion that any emission of uranium from Apollo violated the annual limits at the site boundary?

A: [After objection] . . . I don’t have data to show, because it’s weak data, that the concentration limits averaged over a year were in excess of the annual value.

(June 9, 2012 Ring Dep. at 199:1-13;³⁹ id. at 56:12-20 (“there is insufficient data to show that over an extended period, such as a year” uranium was released from the Apollo facility in excess of Appendix B limits); id. at 56:22-57:5 (Q: “[Y]our report therefore does not contain an opinion that uranium was released from Apollo in excess of the annual limits in Appendix B, correct?

A:[After objection] I would say not . . . I can’t make that claim based on what I was able to find.”) Asked about the statement in his report that “[e]xcessive amounts of ionizing radiation were regularly released into the air,” Dr. Ring conceded that he could not characterize those

³⁸ ECF No. 339.

³⁹ Defs.’ App. Ex. 13.

amounts as in excess of § 20.106 limits when averaged over the course of a year. (June 9, 2012 Ring Dep. at 120:16-121:7.)⁴⁰

In a subsequent deposition, Dr. Ring was asked about this matter again:

Q. And you have not developed an opinion, you told me last time, regarding whether or not the facility violated any regulations regarding effluent limits beyond the restricted area of the facility, correct?

A. That is correct.

(Jan. 12, 2013, Ring Dep. at 41:1-6.)⁴¹

On August 18, 1967, Caldwell submitted a NUMEC “Internal Deficiency Report and Request for Corrective Action” revealing that air levels across the street from the NUMEC property were three times greater than the MPC level permitted by 10 C.F.R § 20.106. (Pls.’ App. Ex. 23.) Defendants respond that Plaintiffs’ statement refers to concentrations for short periods, not annual concentrations at the Apollo facility’s boundaries.

Ronald Crosby reported that levels in the Raychord office building significantly exceed the most generous MPC limit of 8.8 dpm/m³. The levels in the Raychord foreman’s office were 527 dpm/m³, for example, almost 60 times the maximum possible limit. (Pls.’ App. Ex. 24.) Defendants respond that Plaintiffs’ statement refers to concentrations for short periods, not annual concentrations at the Apollo facility’s boundaries.

On September 27, 1967, a NUMEC health and safety technician, E. Schnell, wrote an internal memorandum indicating that airborne concentrations outside the Apollo plant averaged 4000 times the maximum allowable limit when the incinerator was operating. Schnell attempted

⁴⁰ Defs.’ Reply App. Ex. 3.

⁴¹ Defs.’ App. Ex. 14.

to convince his superior, Tom Morton, to shut down the incinerator until the problem had been fixed. In that memo, Schnell admitted that radiation concentrations in the unrestricted area had long been far in excess of federal regulatory limits due to the problems with the incinerator:

The incinerator is still discharging excessive levels of airborne concentration in and out of the NUMEC Apollo plant. Personnel are being over-exposed and contamination is being spread to property adjacent to the Apollo plant. This condition is not new, going back to the birth of the incinerator.... This dangerous situation...has survived several revamping efforts.

During incinerator operation the airborne concentration outside the Apollo plant averages 4000 times the maximum allowable... Contamination on property adjacent to the NUMEC Apollo plant (Raychord) [is] in excess of the MPC by a factor of 6...Serious consequences could result if the above conditions continue.

(Pls.' App. Ex. 25.)

Defendants respond that Plaintiffs' statement refers to concentrations within the facility building and at the stacks, and to concentrations for short periods, not annual concentrations at the Apollo facility's boundaries.

Plaintiffs contend that the incinerator was still operating in March 1968, when Schnell again drew attention to the problem, noting that airborne concentrations outside the plant were "much in excess of the maximum allowable." (Pls.' App. Ex. 26.) Defendants respond that the incinerator was not in continuous operation. The incinerator had been used intermittently before September 1967; as of early 1968, it had been shut down except for brief tests in connection with a redesign. Pls.' App. Ex. 26 at 1 ("The incinerator was operated on February 28, 1968 and March 4, 1968, under various conditions, to evaluate and establish proper incineration of contaminated waste."); see also Defs.' App. Ex. 2 at 17 (explaining incinerator was shut down and fixed during this period).

In March 1968, an internal health and safety memorandum admitted that 41 of NUMEC's

stacks exceeded the MPC by at least a multiple of five, while the stack exhausting from the calciner, feeder and scrubber (Stack #99) had released radiation in an amount more than 1300 times the MPC. Schnell commented that “with present exhaust system, we cannot comply with our [license] regulations.” (Pls.’ App. Ex. 43.)⁴²

At the same time the incinerator was causing excessive concentrations in unrestricted areas, the AEC noted that the north roof fan exhaust concentrations were 51.4 dpm/m³ in February, 1968 and 271.8 dpm/m³ in March, 1968. (Pls.’ App. Ex. 27.) Defendants respond that the roof fans were not located on the roof edge. See Pls.’ App. Ex. 7 (depicting roof fans near center of the Apollo facility roof). Plaintiffs’ statement refers to concentrations within the restricted area and to concentrations for short periods, not annual concentrations at the Apollo facility’s boundaries. (Pls.’ App. Ex. 27 ¶ 53.)

In April, 1968, Schnell wrote a memorandum to Apollo plant manager Sylvester Weber, informing him that not only were the Apollo plant stacks exceeding the MPC on a regular basis, but the roof fans “exhausting plant air to the outside atmosphere are above the MPC by a factor ranging between 6 and 20.” (Pls.’ App. Ex. 28.) Defendants respond that the roof fans were not located on the roof edge.

Over the course of two days in 1967, two incinerator stacks released radioactivity in the amount of 116,932 dpm/m³. (Pls.’ App. Ex. 41.) Defendants respond that the concentration data recorded in the cited document refer to concentrations at the stacks and concentrations for short periods, not annual concentrations at the Apollo facility’s boundaries.

Plaintiffs note that the incinerator stack sample taken on December 8, 1966 was 76,000

⁴² Defendants deny this statement on the ground that Plaintiffs erroneously cite Exhibit 42, which does not support it, but it is clear that this was a typographical error and they meant Exhibit 43.

dpm/m³, more than 8600 times the 8.8 dpm/m³ limit (Pls.' App. Ex. 42 at 3) and that during incinerator operation, airborne concentrations outside the plant average 4000 times the maximum allowable (Pls.' App. Ex. 25).

Caldwell, a NUMEC health safety director, wrote an article in 1966 with employee Ronald Crosby, in which they revealed that NUMEC's stacks frequently exceeded permissible levels. (Pls.' App. Ex. 4 at 2.) Defendants respond that the conclusion of the paper states: "We have demonstrated that the NUMEC uranium plant effluent produces permissible off-site radioactivity concentrations." Id. at 11.

The paper also stated that "the nuclear industry almost traditionally limits stack discharges below permissible concentrations." (Pls.' App. Ex. 4 at 1.) The paper, however, was directed at demonstrating that diffusion and dispersion in the Apollo area were such that the AEC should grant the company "special approval" to exceed the § 20.106 limits at the stack. Caldwell argued that stack sampling (which frequently shows concentrations over the limits) should be abandoned as a method for demonstrating compliance because "Even total continuous sampling of all stacks would not guarantee permissible off site concentrations. For example, the off-site concentration might exceed MPCa because of the summed contributions from several stacks, each of which was discharging concentrations below MPCa." Id. at 2; Pls.' App. Ex. 38 at 1 (reiterating that even continuous sampling of all stacks would be inadequate to demonstrate compliance because the summed contributions from several stacks each discharging below the MPCa might still cause an excess concentration in the unrestricted area).

Defendants respond that the paper concluded: "We have demonstrated that the NUMEC uranium plant effluent produced permissible off-site radioactivity concentrations." (Pls.' App. Ex. 4 at 11.) Continuous sampling of stacks is not stated as a method to be employed or abandoned.

Schnell reported that, of the 41 stacks sampled on March 17, 1968, 73% were above the MPC by a factor of at least five, causing him to remark that “present Apollo stack situation is impossible.” Schnell complained that “past data shows that 70 to 80 percent of the stacks sampled will be above MPC,” and that “attempting to comply to the stack regulation is like attempting to eliminate an ant hill one ant at a time.” (Pls.’ App. Ex. 43 at 3.)

On March 22, 1968, Schnell sent a memorandum indicating that the Apollo plant stack situation was “impossible,” that 73% of the stacks exceeded the MPC by a multiple of five or more, and that the company “cannot comply with our [license] regulation.” (Pls.’ App. Ex. 43.)

During the first eleven days in April, 1968, NUMEC sampled 40 stacks; 47% of those (19) were releasing radioactivity in amounts that were twelve times greater than the MPC limits, while 77.5% were exceeding the MPC by some amount. During the last half of that month, 69% of the plant’s stacks were found to exceed the MPC, while 32% exceeded the MPC by a multiple of six. (Pls.’ App. Ex. 44.) Schnell reiterated that “we cannot comply with our [license]” due to the high percentage of exhaust stacks exceeding the MPC. (Pls.’ App. Ex. 44.)

Plaintiffs contend that Apollo plant stacks released between 115.9 dpm/m³ and 152.4 dpm/m³ during the first six months of 1968, for a monthly average of 133.95 dpm/m³. (Pls.’ App. Ex. 45.) Plaintiffs contend that Apollo plant management had, by 1968, acknowledged that “Most Apollo Stacks discharge above MPCa.” (Pls.’ App. Ex. 13.)

In October, 1968, AEC inspectors cited NUMEC for non-compliance with 10 C.F.R. § 20.106 and their special nuclear materials license. The inspectors stated that stack sampling data demonstrating that stack releases exceeded the MPC were “contrary” to NUMEC’s license, “which requires that 10 CFR 20 limits shall not be exceeded.” The AEC inspectors also observed

that NUMEC had again failed to collect the necessary surveys to demonstrate compliance, and that while the deficient monitoring and the excessive stack concentrations were “two separate items of non-compliance,” they were both “part of the same stack discharge problem.” Significantly, the inspectors reported that “NUMEC recognized that the citation was valid....” (Pls.’ App. Ex. 27 ¶¶ 52, 68.) Defendants respond that the cited document does not state that NUMEC “failed to collect the necessary surveys” or had “deficient monitoring.” It notes that “NUMEC... did not feel there was any real violation,” and that its data showed off-site concentrations to be within Appendix B limits. (Id. ¶ 68.)

On February 5, 1969, Lawrence Low, the Director of the AEC’s Division of Compliance, wrote to NUMEC president Zalman Shapiro, notifying him that NUMEC was again in non-compliance with its license and with § 20.106 because it had released radioactive materials in excess of Appendix B. (Pls.’ App. Ex. 53.) Low noted that NUMEC had applied for authority to take advantage of a dilution factor, but did not take dilution factors into account in finding NUMEC in non-compliance with the regulations as the request had not yet been approved. (Pls.’ App. Ex. 52.) Defendants respond that the cited document requests a written explanation for activity that “appeared” not to be in full compliance and notes that NUMEC’s letter of application for an amendment to its license “to permit use of a dilution factor for stack effluents” was being evaluated. Id. at 1-2. The corresponding AEC inspection report indicated that concentrations at the facility boundary were within Appendix B limits and in compliance with § 20.106. (Pls.’ App. Ex. 27 ¶ 55.) NUMEC also responded by explaining, in a letter dated February 25, 1969, that Appendix B limits were exceeded as measured at stack exhausts, but that “actual concentration[s] in unrestricted areas” were “far below permissible levels.” (Pls.’ App. Ex. 54 at 1.) The AEC took no enforcement action related to the matter. (Knapp Decl. ¶¶ 22, 27.)

In his response, Shapiro responded to Low, Shapiro acknowledged that NUMEC's stacks had exceeded Part 20 limits. Shapiro reminded Low that NUMEC had applied for special approval to increase its stack emissions in light of atmospheric dilution, but admitted that until the request was approved, NUMEC was bound to demonstrate compliance at the stack:

We recognize the necessity for an amendment to our license which would reflect appropriately the means of verifying the effectiveness of atmospheric dilution in reducing concentration in unrestricted areas. In this connection, we submitted on November 13, 1968 a request for an amendment to our license which would place primary reliance on roof perimeter sampling in lieu of stack sampling as a means of measuring releases to unrestricted areas.

(Pls.' App. Ex. 54.)

Defendants respond that the letter indicates that facility emissions were in compliance with § 20.106 and Appendix B limits, which applied to unrestricted areas. The document concerns the means by which NUMEC would verify compliance with 10 C.F.R. § 20.106 at the Apollo facility's boundaries and NUMEC's efforts to conform the Apollo facility's license to reflect those means.

On March 5, 1969, NUMEC tendered to the AEC a revised application for approval to permit the facility to exceed the MPC at the stack in lieu of the data on atmospheric dilution.

(Pls.' App. Ex. 55.) Defendants respond that the document concerns the means by which NUMEC would comply with 10 C.F.R. § 20.106 at the Apollo facility's boundaries and NUMEC's efforts to conform the Apollo facility's license to reflect those means. Defendants indicate that the revision included data from the Caldwell study that showed reductions in radioactivity between the stacks and the off-site areas:

We have demonstrated that the NUMEC uranium plant effluent produces permissible off-site radioactivity concentrations. Even with adverse topography, cramped site boundaries, short stacks and unfavorable winds, the lower atmosphere dilutes our stack concentrations by factors of 100-1000. Restricting

stack effluents to MPCa is unnecessary.

(Pls.' App. Ex. 4 at 11). Therefore, "A single (or even several) stack(s) discharging 100 times [the Appendix B limit] will not produce above permissible concentrations at the roof perimeter." (Pls.' App. Ex. 55 at 1.)

In April, 1969, while NUMEC's application was pending, the AEC again cited the company because concentrations emitted from its stacks exceeded the MPC, noting that this is "a recurring item of non-compliance." (Pls.' App. Ex. 56 at 2 ¶ 2(d)). Defendants respond that data reflecting boundary concentrations indicated that they were within Appendix B limits. Id. ¶¶ 45-46 & Exs. D-E.

In response to the April inspection, Apollo plant manager Sylvester Weber informed company president Zalman Shapiro that the plant stacks were exceeding the MPC, and were in excess of the concentrations permitted by the license. He informed Shapiro that even though NUMEC applied for a license amendment to take advantage of atmospheric dilution, "until acted upon favorably, we remain in noncompliance." (Pls.' App. Ex. 57 at 1.)

Defendants respond that the document concerns the means by which NUMEC would comply with 10 C.F.R. § 20.106 at the Apollo facility's boundaries and NUMEC's efforts to conform the Apollo facility's license to reflect those means. It states that the author "does not believe that we will receive a corrective action request from Headquarters" with respect to the releases. Id. at 1.

In May 1969, the AEC informed NUMEC that it was being cited once again for exceeding 10 C.F.R. § 20.106 and its license, and informed the company that its request for approval to exceed the Appendix B limits was still being evaluated. (Pls.' App. Ex. 58.) Defendants respond that the cited document lists four items with respect to which there

“appeared” to have been incomplete compliance. It requested no further corrective action or explanation with respect to the stack release issue, noting that NUMEC’s letter of application for an amendment to its license “permitting alternative methods for determining compliance with 10 CFR 20.106” was being evaluated. Id. at 2. The AEC took no enforcement action related to the matter. (Knapp Decl. ¶¶ 22, 27.) The corresponding AEC inspection report indicates that concentrations at the facility boundary were within Appendix B limits and in compliance with § 20.106. (Pls.’ App. Ex. 56 ¶¶ 45-46, Exs. D-E.) The letter did not discuss a NUMEC request “for approval to exceed the Appendix B limits.”

On May 26, 1969, the AEC informed NUMEC that its request to exceed the MPC at the stack has been approved, subject to two conditions – that the company continuously sample the air at the perimeter of the roof, and that it conduct a routine environmental air sampling program. The AEC cautioned NUMEC that “We consider the environmental sampling program required by Condition 2 . . . to be a means of providing backup data and evidence that your roof edge sampling results are adequately representative of the concentrations released to the unrestricted area.” (Pls.’ App. Ex. 18 at 1-2.) Defendants respond that the document concerned the means by which NUMEC would comply with 10 C.F.R. § 20.106 at the Apollo facility’s boundaries and NUMEC’s efforts to conform the Apollo facility’s license to reflect those means. They note that the license amendment explicitly authorized rooftop stack emissions up to 100 times the Appendix B limits, but continued to require, consistent with § 20.106, that Appendix B limits be met at the roof edge.

NUMEC at one point exceeded the MPC by more than 100,000 times. (Pls.’ App. Ex. 59 at 8-9) (concentrations of uranium released from the stack were 102,866 times the MPC); Id. Ex. 12 (noting that releases from five stacks in 1977 exceed the MPC when averaged over the year;

many more exceeded the MPC at various times during the year); Id. Ex. 2 at 27 (demonstrating that NUMEC exceeded the new 100 x MPC limits until at least 1973).

In January and February 1969, NUMEC sampled seventeen unfiltered stacks and seven roof fans for one minute each (despite the fact that company protocol called for four-hour samples); the average weekly concentration ranged from 39.4 dpm/m³ to 79 dpm/m³. Significantly, the January 1969, average concentration released from stacks that were filtered to catch radioactive particles before they could be released was 161.4 dpm/m³, more than twice the average released from those stacks that had no filter. (Pls.' App. Ex. 46.) President W.A. Cameron stated that if information reported to him regarding such losses was correct, the company was guilty of "gross irresponsibility." (Pls.' App. Ex. 47.) Defendants respond that the document does not state that the company protocol called for four-hour samples.

During an inspection, the AEC noted that measurements collected at environmental (offsite) air samplers indicated that from January, 1969 through May 26, 1969, at least one environmental air sample exceeded the MPC. (Pls.' App. Ex. 29 at 12 ¶ 34c.) ("All [environmental air samplers] were below MPC of 8.8 dpm/m³ after May 26, 1969. On May 14 sample No. 5 was 14.4 dpm/m³ and on January 3 it was 48.6 dpm/m³....The decrease in sample activity of No. 5 is noticeable following the shutdown of the incinerator on July 1, 1969").

In 1974, B&W employee Robert Williams revealed that radiation levels in the community were well above natural background, a circumstances he attributed to the fact that stack samples exceeded the MPCs. In the area north of the Apollo plant, for example, Williams noted that radioactivity in the air was 76 times background, radioactivity detected by fallout collectors was 1700 times background, and radioactivity in soil and vegetation was 347 times background. (Pls.' App. Ex. 30 at BW00160941.)

Defendants respond that Plaintiffs' statement with respect to the area north of the Apollo plant does not compare levels there to 10 C.F.R. § 20.106 and Appendix B limits or to any other regulatory standard.

Finally, Plaintiffs' expert noted in his report that the dose rate measured at the Apollo plant north exceeded 500 millirem per year during 1972-1978, thereby demonstrating a violation of § 20.105(a). (Franke & Makhijani Rpt. at 36, Table 7; Franke Aff. at 1.) The dose rate imposed in § 20.105 was also exceeded in the Raychord facility in 1972, and the hourly dose rate was exceeded at the Kiskiminetas river shoreline. (Franke Aff. at 1; Pls.' App. Ex. 32.) Indeed, dose levels in the unrestricted area exceed the limits set in 10 C.F.R. § 20.105 by a multiple of 10, a "serious problem" that had NUMEC fearing for its license. (Puechl Dep. at 167-70 & Ex. 22.)⁴³

Defendants respond that Plaintiffs' statement is immaterial because § 20.105 concerns external radiation rather than inhaled uranium from airborne effluent. Pursuant to this Court's orders, plaintiffs "may not pursue, offer, or rely upon evidence referring or relating to any claim based on the theory of exposure via any pathway other than inhalation of enriched uranium released into the air from the Apollo Facility during its period of operation." McMunn v. Babcock & Wilcox Power Generation Group, 896 F. Supp. 2d 347, 364 (W.D. Pa. 2012). See also Hall, 69 F. Supp. 2d at 730 (since the plaintiffs claimed no injuries from external radiation, § 20.105 was irrelevant).

In 1977, company data indicated that at least five stacks exceeded the MPC during the entire year, while nine stacks exceeded the MPC for at least one month during that year, and

⁴³ Pls.' App. Exs. 33, 34.

25 exceeded the MPC at some point during the year. (Pls.' App. Ex. 12.)

In 1978, NUMEC opted to shut down the high-enriched uranium processing operations at the Apollo facility. (Pls.' App. Ex. 48.)

Plaintiffs note that the Federal Government listed the Apollo facility as part of the special exposure cohort. As part of the process NIOSH commissioned a review of data maintained at the Apollo facility. According to the report generated as a result of the review:

The SEC Petition Evaluation Report for petitions SEC-00047 and SEC-00080 (NIOSH 2007c) determined that it is not feasible to reconstruct ambient environmental dose from 1957 through 1965 based on limitations associated with stack monitoring data. Reliable information for the period after 1965 could not be found to bound the internal and external ambient dose, as described below.

(Pls.' App. Ex. 60 at 25.)

Defendants respond that this report concerns occupational exposure of radioactivity for a certain set of former NUMEC employees. *Id.* at 10-11. It does not refer to releases to unrestricted areas in excess of Appendix B limits.

A March 2014 report of the Inspector General of the NRC, stated "according to the president and founder of the company that buried materials at the SLDA site, the documents used as a basis for the current FUSRAP remediation effort underestimate the material buried there." (Pls.' App. Ex. 62.) Defendants respond that Plaintiffs' statement is immaterial because it concerns alleged radiation from the SLDA site rather than inhaled uranium from airborne effluent. Pursuant to this Court's orders, Plaintiffs "may not pursue, offer, or rely upon evidence referring or relating to any claim based on the theory of exposure via any pathway other than inhalation of enriched uranium released into the air from the Apollo Facility during its period of operation." McMunn v. Babcock & Wilcox Power Generation Group, 896 F. Supp. 2d 347, 364 (W.D. Pa. 2012).

Which radionuclide measurement to use

Plaintiffs argue that the Apollo plant emitted not only uranium but also other radionuclides, including Plutonium-239, and therefore the measurement that applies is the one for the radionuclide in the mixture with the lowest permissible amount, that is, 6×10^{-14} millicuries per milliliter, or 0.6 picocuries. 10 C.F.R., Part 20, App. B, Note Nos. 2, 3(a), 25 Fed. Reg. 10914, 10923 (Nov. 17, 1960). Defendants respond that the Court has already held that Plaintiffs presented a prima facie case only with respect to uranium. Further, they note that Plaintiffs' proposed measurement of 0.6 or 0.4 picocuries/milliliter, based on Appendix B limits for radionuclide mixtures, was never used at any time by anyone regarding the Apollo plant. In fact, Plaintiffs' own expert used 4.0 picocuries/milliliter, as did the AEC. (Pls.' App. Ex. 2, Ex. 27 ¶ 55, Ex. 29 ¶ 34b.)

Plaintiffs have not supported their suggestion that any measurement other than the one for uranium should apply. As noted above, the Court has already ruled that they did not establish a prima facie case other than for uranium and no one has ever utilized the limits Plaintiffs propose, including the AEC, the NRC and Plaintiffs' own expert. Therefore, the measurement for uranium should be applied in these cases.

Was the roof a restricted area?

Plaintiffs contend that the roof of the Apollo plant was an unrestricted area and that, in the Hall case, Judge Ambrose held that there was evidence supporting this conclusion. Defendants respond that Plaintiffs rely on a typographical error, misreading of documents and rejection of the NRC's finding on this very issue. They also contend that, in the Hall case, Judge Ambrose erroneously interpreted a piece of evidence which referred to the roof area as "unrestricted" as referring to the Apollo facility roof, when in fact it related to the roof of an

adjoining building not owned by NUMEC.

As noted above, the word “unrestricted” in the February 1966 NUMEC letter to the AEC is a typographical error, as the context makes clear (referring to “no outside ladders,” the only access being an “inside ladder,” the hatch is “kept locked,” etc.). (Pls.’ App. Ex. 38 at 1¶ II.) Other references to an unrestricted roof area concern the roof of the Raychord building, not the Apollo plant.⁴⁴ And Mr. Franke admitted that the stacks were in the restricted area on the roof. For all the reasons discussed above, Defendants have demonstrated that there is no genuine issue of material fact that the roof of the Apollo plant was a restricted area.

Where to take the measurement

Defendants argue that the regulation concerns measurements made at the roof boundary, not at the stacks themselves, because although the emissions came from the stacks, the point at which the stacks emitted was on the rooftop, a restricted area. Plaintiffs contend that Defendants are not permitted to rely on measurements taken at the roof edge because they did not make appropriate dilution and dispersion models at the time, and therefore the measurements must be those made at the stacks.

As noted above, § 20.106(d) stated that:

For the purposes of this section the concentration limits in Appendix “B”, Table II of this part shall apply at the boundary of the restricted area. The concentration of radioactive material discharged through a stack, pipe or similar conduit may be determined with respect to the point where the material leaves the conduit. If the conduit discharges within the restricted area, the concentration at the boundary

⁴⁴ It is possible that, in the Hall litigation, Judge Ambrose may have concluded that language in the June 5, 1964 letter from the AEC to NUMEC cited above stating that the “the roof area is an unrestricted area” (Pls.’ App. Ex. 37 at 2) referred to the NUMEC facility roof, 69 F. Supp. 2d at 720, when it in fact referred to the roof of the Raychord building. The issue in these cases is to determine, based on the evidence submitted herein, whether there are genuine issues of material fact as to whether the roof the Apollo plant was a restricted area or an unrestricted area.

may be determined by applying appropriate factors for dilution, dispersion, or decay between the point of discharge and the boundary.

The AEC added subsection (d) to the 1964 revision of Section 20.106 to clarify, not change, prior versions of the regulations. The AEC stated that the revision was “consistent with 20.106(c) of the presently effective regulation.” Radioactivity in Effluents to Unrestricted Areas, 29 Fed. Reg. at 14434.⁴⁵ The AEC explained that it was adding the references to dilution, dispersion, and decay “to eliminate any implication that determination of the concentration discharged through a conduit must be made by measurement at the point of discharge.” *Id.*; see also Knapp Decl. ¶ 12.⁴⁶

Plaintiffs contend that the second sentence of this section requires the measurement to be made at the stacks, the “point at which the material leaves the conduit.” They further argue that Defendants in effect forfeited the right to measure the effluent at the boundaries when they did not measure the discharge at the stacks and perform the dilution, dispersion and decay analysis at the time the plant was in operation. Therefore, they contend that the stack data should be utilized, without adjustment, to determine if Defendants violated § 20.106.

Defendants respond that this reading renders the next sentence – which states that the concentration may be determined by applying appropriate factors for dilution, dispersion and decay – meaningless. In addition, they note that this reading is at odds with the entire regulation, which provides that Appendix B limits apply to public, unrestricted areas. 10 C.F.R.

⁴⁵ Defs.’ App. Ex. 7.

⁴⁶ Defendants note that the TMI opinion, 67 F.3d at 1116, n.31, quotes and interprets § 20.106(d), but not the third sentence dealing with situations like that at the Apollo facility where stacks discharged within the restricted area. The TMI footnote explains that a violation can occur if radiation is excessive at a conduit exit “if applicable.” Conduit exit levels are applicable when a stack exhausts at or beyond the facility boundary—a situation not pertinent here.

§ 20.106(a). Finally, they contend that Plaintiffs' forfeiture argument does not withstand scrutiny and that courts have rejected similar attempts to conclude that any failure to comply with a condition of a facility's license or directive of AEC inspectors constitutes an actionable breach. See In re TMI, 67 F.3d at 1110, 1113-15 (duty of care is established in §§ 20.105 and 20.106, not in other more stringent regulations mandating that release levels be "as low as reasonably achievable"); Adkins, 960 F. Supp. 2d at 772-73 (same, also refusing to impose liability based on § 20.201, which requires a facility to "survey" its emissions).

Plaintiffs cite no authority in support of their proposed reading of the regulation. As Defendants observe, Plaintiffs' interpretation would render the third sentence meaningless. The Supreme Court has long held that "a statute ought, upon the whole, to be so construed that, if it can be prevented, no clause" is rendered "superfluous, void or insignificant." TRW, Inc. v. Andrews, 534 U.S. 19, 31 (2001) (citations omitted). There is no reason to believe this principle does not apply equally to regulations. It would also be at odd with § 20.106(a), which provides that Appendix B limits apply to public, unrestricted areas.

By contrast, Defendants' reading conforms to the manner in which the regulation (which was promulgated by the AEC) has been interpreted by the AEC and the NRC, respectively, when these agencies found that the facility was in compliance with Appendix B limits in 1966 (Defs.' App. Ex. 26), and in 1995 (Defs.' App. Ex. 37), as well as when the AEC approved the license amendment in 1969 endorsing roof perimeter monitoring and allowing stack discharges up to 100 times Appendix B limits (Defs.' App. Ex. 34; Knapp Decl. ¶ 28).

In addition, Plaintiffs offer no support for their theory that Defendants forfeited the right to have the measurement taken at the boundaries because they did not measure effluent at the stacks and perform dilution and other adjustments at the time. As TMI and other courts have

held, what matters in case such as these is whether Defendants violated § 20.106, not some other regulation, license requirement or other issue. Defendants may rely on measurements taken at the boundary of the restricted area, not those taken at the stacks.

Using the measurements for airborne uranium, measured at the boundary of the NUMEC roof because the roof itself was a restricted area, Plaintiffs have pointed to no genuine issues of material fact that the annual average concentration of uranium effluent ever exceeded 1.7×10^{-2} microcuries/milliliter during the period 1957-1960, or that it ever exceeded 4.0×10^{-12} microcuries/milliliter during the period 1961-1983. Rather, they have pointed to numerous individual instances of high measurements taken on specific days at the stacks during the 1966-69 period. (Pls.' App. Exs. 25, 26, 27, 28, 41, 43, 44, 45, 46.) These individual instances, however, are not sufficient to meet the standard.

In addition, to establish a breach of duty, Plaintiffs must offer evidence from a qualified expert that the Apollo facility's emissions exceeded regulatory limits. See Koester v. Amergen Energy Co., 2008 WL 879459, at *7 (C.D. Ill. Mar. 28, 2008); Lokos v. Detroit Edison, 67 F. Supp. 2d 740, 743-44 (E.D. Mich. 1999). When direct measurements of effluent concentrations at a boundary are unavailable, estimating those concentrations from stack discharges is extremely technical and complicated. See Defs.' App. Ex. 28 at 2-3. Even Dr. Melius indicated that he could not do it. (Mar. 31, 2014 Melius Dep. at 277:18-278:15.)⁴⁷

The only expert evidence Plaintiffs proffer on this issue is the testimony and report of Mr. Franke, but he erroneously applied the unadjusted concentration limits as measured at the stacks,

⁴⁷ Defs.' App. Ex. 15.

not at the boundaries.⁴⁸ That is, Mr. Franke's data for measurements taken at the stacks may well be accurate, but he committed an error of law in relying upon this data, rather than measurements taken at the boundaries, in analyzing whether Defendants violated § 20.106. Mr. Franke admitted that the stacks on the roof were in a restricted area and he offered no explanation for his reliance on the stack measurements. By contrast, Defendants' expert has stated that, from 1966 to 1980, monitors at the facility's roof perimeter recorded the concentration of radioactivity in airborne effluent and that the average annual concentration of uranium measured at each roof perimeter monitor was below 4×10^{-12} microcuries/milliliter in each of those years. Monitors at nearby offsite locations showed even lower concentrations. (Whipple Decl. ¶¶ 4-5, 7 & Tables 1-2.) Plaintiffs have not explained why these statements are inaccurate.

Courts have also rejected the argument that a defendant's alleged failure to keep complete monitoring records relieves a plaintiff of its duty to prove dose levels. Koester, 2008 WL 879459, at *7-8 (plaintiff's argument that recorded dose levels were gross undercounts because measured at the wrong location and "actual levels could be off the chart" rejected as speculative, and summary judgment granted for failure to establish exceedance of dose level); O'Connor, 2005 WL 6035255 at *34, 40 (despite claim by plaintiff expert Makhijani that adequate radioactive monitoring of effluents was not conducted by the defendant, making reconstruction of a reliable estimate of emissions "extremely difficult," plaintiffs still had to

⁴⁸ Defendants argue that, in the Hall case, Judge Ambrose erroneously found, 67 F. Supp. 2d at 719-20, that ambiguous trial testimony by Mr. Franke and certain letters from the AEC established violations of § 20.106, when a full examination of this evidence demonstrates that it related to stack emissions. ECF No. 332 at 20 n.19, 22 n.20. Again, it is not this Court's responsibility to review the findings of the Hall case, but to evaluate the evidence presented herein.

prove exposure to radiation in excess of the permissible dose limits).

For all of these reasons, Defendants' motion for summary judgment based on Plaintiffs' failure to raise a genuine issue for trial on breach of duty should be granted. Although this recommendation, if adopted, would result in the dismissal of at least the first eleven cases, a discussion of Defendants' other potentially dispositive motion (Plaintiffs' alleged failure to provide evidence regarding exposure and dose) follows.

Evidence Regarding Exposure and Dose

Defendants move for summary judgment on the ground that Plaintiffs have failed to proffer evidence regarding exposure and dose. Specifically, they contend that, because liability requires proof that a plaintiff was exposed to radiation in excess of background amounts and because Plaintiffs have failed to proffer even estimates of their exposure or the doses they received, they cannot establish a basis for holding Defendants liable.

In response, Plaintiffs argue that they have proffered prima facie evidence of causative exposure, that the Court's prior rulings with respect to exposure and dose constitute the law of the case, that the Third Circuit's TMI opinion does not require quantification of dose, and that Defendants are estopped from arguing that Plaintiffs are required to make more precise showings of exposure and dose.

In a reply brief, Defendants contend that Plaintiffs' legal arguments are flawed because the law of the case doctrine does not apply to interlocutory orders, and their estoppel argument relies on one inapplicable case and an inaccurate factual premise that Defendants' failure to keep records precludes them from quantifying the exposure and dose. They further contend that Plaintiffs' single factual argument does not create an issue of material fact because Mr. Franke, Dr. Ring and Dr. Ketterer do not provide evidence of exposure and dose and thus Dr. Melius

(who claims to have relied on their evidence) could not provide evidence that each plaintiff either was exposed to uranium in excess of natural background or received a resulting dose.

Facts as to Exposure and Dose⁴⁹

Plaintiffs' expert Mr. Bernd Franke is a radio-ecologist who specializes in the study of radiation and the environment. He testified that "dose" is the "starting point of any causation analysis." (May 29, 2012 Franke Dep. at 40:9-13.)⁵⁰ Plaintiffs' expert Dr. Joseph Ring testified that approximately "300-millirem-per-year radiation dose" from natural background sources "would be typical" and that the actual background dose to individuals in the United States can vary depending on many factors, with annual whole-body doses ranging from 100 millirem to 2,000 millirem (or 2 rem). (Jan. 12, 2013 Ring Dep. at 119:14-120:17, 150:16-151:6.)⁵¹

Plaintiffs' expert Dr. James Melius, their specific causation expert, testified that the average Plaintiff would have received between 240 and 300 millirems every year from natural background sources of radiation, but that an exposure as low as 1 millirem (less than what a person receives crossing the country in an airplane) could constitute a "significant" or "substantial" exposure. (Jan. 9, 2013 Melius Dep. at 443:10-17;⁵² May 30, 2012 Melius Dep. at 167:23-168:7.⁵³) When asked whether the "added radiation from [Apollo]" would have taken any Plaintiff outside the average range of natural background radiation, Dr. Melius stated, "I'm not sure I can answer that . . . without having – being able to quantify the exposure from the Apollo

⁴⁹ These facts are taken from Defendants' Concise Statement (ECF No. 321). As explained below, Plaintiffs do not dispute them.

⁵⁰ Defs.' App. (ECF No. 320) Ex. 1.

⁵¹ Defs.' App. Ex. 15.

⁵² Defs.' App. Ex. 10.

⁵³ Defs.' App Ex 9.

facility.” (Mar. 31, 2014 Melius Dep. at 148:2-149:5.)⁵⁴

Mr. Franke did not calculate a uranium dose for any Plaintiff in this case. His two-page 2012 Rule 26 expert report consists almost entirely of an updated “scenario [lung dose] calculation” to a hypothetical person located along the Apollo site boundary during fifteen minutes on February 9, 1963. (Defs.’ App. Ex. 3 ¶ 6; May 29, 2012 Franke Dep. at 41:21-25.) Mr. Franke testified that his scenario dose calculation from the 1963 event (also referred to as a “vault fire”) was to a “hypothetical person, not an actual plaintiff in this case.” (May 29, 2012 Franke Dep. at 83:9-14.) Mr. Franke did not attempt to connect his hypothetical, “scenario calculation” to a single Plaintiff. (*Id.* at 83:5-19) (testifying that he did not determine whether any Plaintiff in this case was among the “members of the public” potentially exposed to the alleged 1963 release). Mr. Franke did not review any of the Plaintiff-specific information generated during discovery, including Plaintiffs’ questionnaire responses, deposition transcripts, or medical records. (*Id.* at 37:13-16) (testifying that he was “not aware” that Plaintiffs completed questionnaires), 37:5-12 (“I was not told that [Plaintiffs] were deposed and I wasn’t asked to read the depositions if they exist.”), 42:16-43:7 (confirming no knowledge of Plaintiffs’ diseases and relevant organs).

Mr. Franke testified regarding the importance of connecting his opinions about the alleged release of uranium from the Apollo facility to individual Plaintiffs: “[I]n order to calculate a dose to some adult . . . you have to put that person in some relationship to the source term, correct? A: Yes.” (May 29, 2012 Franke Dep. at 52:21-25.) In preparing his “scenario calculation,” Mr. Franke was “assuming somebody was at [a] point close to the facility.” (*Id.* at

⁵⁴ Defs.’ Reply App. (ECF No. 364) Ex. D.

53:20-54:1.) But he “made no attempt in this case to determine whether, in fact, any particular plaintiff was near the Apollo facility during those 15 minutes in 1963.” (Id. at 55:24-56:3.) Mr. Franke testified that if an expert does not correlate opinions regarding alleged releases of uranium from Apollo to any particular Plaintiff, that information has no bearing on whether any such Plaintiff was exposed to uranium or received a dose from uranium released from Apollo: “If the person is, of course, not present in any way related to the wind direction, the wind blows opposite to his location, then, of course, that person would receive zero [dose].” (Id. at 70:5-8. He also testified that exposure is the predicate for calculating an individual’s radiation dose. (Id. at 80:15-18) (“[Y]ou agree that in order to have a dose, someone has to first be exposed to a radionuclide like uranium, right? A: Yes.”).

Mr. Franke “did not do any dose calculation or exposure estimate for any specific plaintiffs,” and he did “not expect to be asked about radiation exposures of individual plaintiffs.” (May 29, 2012 Franke Dep. at 50:2-5; see also Jan. 7, 2013 Franke Dep. at 21:14-22 (confirming same)).⁵⁵

Plaintiffs’ expert Dr. Joseph Ring is a radiation safety officer. His Rule 26 opinions are focused solely on “radiation control practices” at the Apollo facility. (June 9, 2012 Ring Dep. at 79:4-80:12.)⁵⁶ He did not review Plaintiffs’ questionnaire responses, depositions, or medical records to determine the relevant cancers or organs of interest and he testified that no aspect of his work relates to a single Plaintiff. Dr. Ring testified that his expert opinions have nothing to do with what occurred beyond the restricted boundary of the Apollo facility. (Jan. 12, 2013 Ring

⁵⁵ Defs.’ App. Ex. 2.

⁵⁶ Defs.’ App. Ex. 14.

Dep. at 141:10-15; 151:7-13; 154:4-155:7.)⁵⁷ Using a diagram of the Apollo facility and its immediate surroundings, he drew a circle around the facility and stated that the area outside of the circle – i.e., the Apollo community and surrounding neighborhoods – were “not covered by” any of the opinions in his report. (Jan. 12, 2013 Ring Dep. at 156:9-24 & Ex. 9; see also id. at 152:21-25, 154:17-155:12.)

Dr. Ring testified that “[k]nowing or calculating a dose” is the “starting point” for calculating radiation risk. (June 9, 2012 Ring Dep. at 183:4-15.) When asked whether he would “need to know the dose” “when making a determination about whether a particular person’s cancer [was] caused by radiation exposure from a man-made source or in this case Apollo,” Dr. Ring testified: “I would want to calculate a dose.” (Id. at 186:5-14.) Dr. Ring testified that he did not address the question of Plaintiffs’ potential exposures, nor did he “specifically calculate a dose” for any Plaintiff. (Id. at 37:20-25 (“Definitely did not do exposure opinions.”); id. at 65:18-20; 88:23-89:5 (confirming no opinion about general or organ-specific doses for Plaintiffs); at 187:18 (“I didn’t look at dose.”).

When asked whether radiation science requires knowing an individuals’ dose, Plaintiffs’ expert Ronald Kathren testified that “dose is a critical component in understanding causation.” (Kathren Dep. at 78:18-21.)⁵⁸ The Health Physics Society, of which Mr. Kathren is the past President and Plaintiffs’ expert Dr. Joseph Ring is a member, states: “Based on the extensive knowledge of radiation health effects, the Health Physics Society believes that a person’s radiation dose must be considered in determining whether to provide compensation for a disease

⁵⁷ Defs.’ Reply App. Ex. C.

⁵⁸ Defs.’ App. Ex. 7.

that could have been caused by radiation.” Compensation For Diseases That Might Be Caused By Radiation Must Consider The Dose, Position Statement of the Health Physics Society at 1 (adopted Mar. 2000).⁵⁹

Plaintiffs’ expert Dr. Howard Hu is an epidemiologist and Plaintiffs’ general causation expert. He was not tasked with assessing the exposure or dose of any Plaintiff. His report provides no opinion as to any specific Plaintiff’s alleged exposure to uranium, nor does it address whether any specific Plaintiff’s cancer was caused by alleged exposures to uranium. (Hu Expert Rpt. at 1;⁶⁰ May 24, 2012 Hu Dep. at 24:7-13.⁶¹) Dr. Hu agreed that “[i]t was never the intention that you would be an expert on estimating the exposure pathways or the doses that these plaintiffs would have received from radiation[.]” (May 24, 2012 Hu Dep. at 13:2-6.) Dr. Hu does not rely on any other Plaintiff expert’s opinions as to Plaintiffs’ exposure or resulting dose. Dr. Hu testified, “I have not seen a formal exposure assessment done for each plaintiff.” (Id. at 133:16-20. He also responded “I don’t know” when asked if “a quantitative exposure assessment [had] been performed for any plaintiff by any plaintiffs’ expert.” (Id. at 134:16-19.)

At a later deposition, Dr. Hu was asked “[w]hich of the plaintiffs’ experts actually gives the opinion that each of the plaintiffs in this case were exposed to highly enriched uranium from the Apollo facility?” He responded: “I don’t recall.” (Jan. 10, 2013 Hu Dep. at 251:18-23).⁶²

Dr. Michael Ketterer is a chemist who analyzed soil samples he took around the Apollo and Parks facilities in 2012. He testified that the results from his uranium soil testing fall well within the range of the natural background uranium that has existed on the planet for millions of

⁵⁹ Defs.’ App. Ex. 17.

⁶⁰ Defs.’ App. Ex. 6.

⁶¹ Defs.’ App. Ex. 4.

⁶² Defs.’ App. Ex. 5.

years. (Ketterer Dep. at 129:20-132:11.)⁶³ Dr. Ketterer testified that he did not connect any of his opinions to an actual Plaintiff, id. at 75:3-23, and that he was not asked by Plaintiffs’ counsel to do that work. (Id. at 37:11-38:7.) Dr. Ketterer’s opinions do not address whether a particular Plaintiff was exposed to these background levels of uranium. (Id. at 37:11-38:7.) Dr. Ketterer’s opinions do not establish when uranium might have been released from Apollo. (Id. at 76:3-11.) Dr. Ketterer’s opinions do not establish whether any Plaintiff was exposed to uranium from Apollo or received any dose from such an exposure. (Id. at 37:11-23 (“In my report, I am not addressing exposure. . . . [I]t is outside my field of expertise.”); id. at 40:9-12 (“No, I have not attempted to calculate a dose.”).

Defendants note that Plaintiffs’ sole specific causation expert Dr. James Melius offers a nearly identical expert opinion for each Plaintiff: (1) that he or she “would have been exposed to substantial amounts of enriched radioactive uranium and other radioactive materials emitted from the Apollo facility[,]” (2) that he or she “would have inhaled these emissions and also inadvertently ingested them,” and (3) that he or she “would have also been exposed to the radioactive emissions from the episodic releases that occurred at the facility.” See, e.g., Melius Rpt. at 7 (W. Artman).⁶⁴ They indicate that, for each Plaintiff, Dr. Melius offers this opinion (or one substantially like it) regardless of the person’s age, residential history, or proximity to the facility over time. They also note that Dr. Melius did not correlate any Plaintiff’s alleged exposure to any release of uranium from Apollo (i.e., to connect any hypothetical exposure to any Plaintiff), including the 1963 vault fire upon which Mr. Franke based his “scenario”

⁶³ Defs.’ App. Ex. 8.

⁶⁴ Defs.’ App. Ex. 13.

calculation for a “hypothetical” person. (Jan. 9, 2013 Melius Dep. at 454:20-455:13; Mar. 31, 2014 Melius Dep. at 137:21-139:12, 220:20-221:2.)

Dr. Melius testified that none of Plaintiffs’ experts analyzed exposure or dose to any Plaintiff. When asked if he agreed “that none of those five documents that you mentioned [including the other plaintiff expert reports] contain an opinion or statement that the plaintiffs were exposed to uranium from Apollo,” Dr. Melius testified, “[s]pecifically to the individual plaintiffs, that is correct.” (Nov. 14, 2013 Melius Dep. at 208:13-209:15.)⁶⁵ Dr. Melius testified that he does not possess the skills or qualifications to perform a dose reconstruction, and he did not estimate the magnitude of alleged releases of uranium from Apollo over any period of time. (Nov. 14, 2013 Melius Dep. at 241:19-243:15.) Dr. Melius testified that he has never quantified a dose or dose range for any individual, be it a worker or a member of the public, based on his own independent work. (Id. at 319:17-320:12.)

Dr. Melius testified that never in his career has he used the scientific models or data that are required to perform a dose assessment for individual members of the public. (Nov. 14, 2013 Melius Dep. at 319:17-320:12.) Dr. Melius testified that he never reviewed any of the historical documents available relating to the Apollo facility. (Id. at 243:23-244:21) (“Q: . . . you did not review any original source documents regarding the operation at the Apollo facility, correct. A: Correct.”). Dr. Melius testified that he knew about the existence of a database containing millions of pages of historical operational records, but chose not to review this information or make any other effort to independently evaluate the conclusions reached by any expert upon whom he relies. (Id. at 249:11-250:21.) Dr. Melius testified that he is unable “to parse out . . .

⁶⁵ Defs.’ App. Ex. 11.

what the relative contribution was from uranium versus these other radioactive materials” with respect to each Plaintiff’s exposures and the development of their respective cancers. (Mar. 31, 2014 Melius Dep. at 219:14-19.) Despite using the terms “significant” and “substantial” interchangeably in his report to characterize each Plaintiff’s purported exposure, Dr. Melius testified that he has no ability to quantitatively define what those terms mean for each Plaintiff, and cannot give a lower bound estimate of those terms. (Jan. 9, 2013 Melius Dep. at 441:5-16; May 30, 2012 Melius Dep. at 167:6-22.)

Plaintiffs do not dispute the accuracy of any of these facts. Rather, with respect to each one, they respond with the same paragraph:

Under the law of the Third Circuit and the law of this case, Plaintiffs dispute the materiality of this statement. Moreover, Plaintiffs dispute the accuracy of the quotation as taken out of context and not reprinted without edit. Plaintiffs rely upon the statements of fact below. Plaintiffs further rely upon documents and briefing submitted in accordance with the *Daubert* and Lone Pine process conducted by this Court as well as the statement of material fact submitted by Plaintiffs under L.R. 56.C.1 in opposition to Defendants’ Motion for Summary Judgment Based on the Plaintiffs’ Failure to Raise a Genuine Issue for Trial on Breach of Duty.” [sic]

(ECF No. 342.) Defendants have filed a motion to deem their statements of fact admitted (ECF No. 361), in which they contend that Plaintiffs have not denied their facts and have not complied with Local Rule 56.C.1, in that they have not set forth the basis for any potential denial with appropriate reference to the record. In addition, they note that ten of their facts (Nos. 13, 18, 22, 23, 24, 25, 30, 31, 32, 34)⁶⁶ do not contain any quotations, and thus the boilerplate response that “Plaintiffs dispute the accuracy of the quotation as taken out of context and not reprinted without

⁶⁶ In their Local Rule 56.C.1 Response (ECF No. 342), Plaintiffs renumbered Defendants’ statements, which were in sections, so that they were all sequential and Defendants utilize Plaintiffs’ renumbering for the sake of clarity.

edit” cannot even apply.

Plaintiffs have not responded to this motion. Because Plaintiffs have not denied Defendants’ facts or cited support in the record which would justify their denial in any event, Defendants’ motion should be granted and all of the facts in their statement should be deemed admitted. LCvR56.E. See Bouriez v. Carnegie Mellon Univ., 2005 WL 2106582, at *3 (W.D. Pa. Aug. 26, 2005); Keyes v. Chamberlin, 2011 WL 113445, at *1 n.2 (W.D. Pa. Jan. 13, 2011).

Plaintiffs do cite to the reports of their experts and some other records, contending that:

1) Dr. Ring testified to extensive use of EU at the Apollo plant and inadequate monitoring, which nevertheless revealed frequent, large-scale releases of EU into surrounding neighborhoods, numerous unmonitored release points, and a staggering amount of EU not otherwise accounted for, all of which supports an inference that NUMEC regularly and frequently released excessive amounts of EU into the Apollo community throughout the period of its operation of the Apollo plant (Ring Rpt. at 5-7)⁶⁷; 2) Dr. Ketterer testified to soil sampling demonstrating the widespread presence of EU traceable (by its isotopic composition) to the Apollo plant within 2.5 kilometers of the plant (Ketterer Rpt. at 6)⁶⁸; 3) Mr. Franke testified to records showing aerial emissions of EU from the Apollo plant in excess of permissible limits during each year from 1963 to 1979 (Franke Rpt. at 28 & Table 4)⁶⁹; 4) based on the foregoing testimony of Drs. Ring and Ketterer and Mr. Franke, and on a review of each Plaintiff’s residential and employment history, Dr. Melius concluded, using methodology this Court has found reliable, that each of the Plaintiffs included in his report had sufficient exposure to EU from the Apollo plant to be a cause of his or

⁶⁷ Pls.’ Resp. (ECF No. 342) Ex. 1.

⁶⁸ Pls.’ Resp. Ex. 2.

⁶⁹ Pls.’ Resp. Ex. 3.

her cancer (Melius Rpt. at 3, 4-51)⁷⁰; 5) this Court held that the testimony of these experts set forth a prima facie showing of exposure to uranium from the Apollo plant in the Lone Pine opinion (“Plaintiffs have presented prima facie evidence that this exposure occurred during the years of operation of the Apollo facility”)⁷¹; 6) this Court has observed that “the record is replete with NUMEC’s failure to monitor emissions and its failure to retain accurate records regarding inventory, yields and process losses related to uranium. A quantitative dose calculation, therefore, may in fact be far more speculative than a qualitative analysis.” (Daubert Op. at 26); 7) in 2007, NIOSH determined that it lacked sufficient information to estimate radiation doses for workers at the Apollo plant (NUMEC Apollo SEC Petition Evaluation Report, No. SEC-00080 at 17 (Aug. 31, 2007)⁷²; 8) throughout the course of its operational life, the Apollo facility was considered by federal regulators as the “worst offender” in AEC history for its failures to monitor and control its special nuclear materials (BWM 00020095- BWM 00020096)⁷³; 9) according to one document, “during a stack sampling program, 50 stacks will be sampled and past data shows that 70 to 80 percent of the stacks sampled will be above the MPC Attempting to comply to the stack regulation is like attempting to eliminate an ant hill one ant at a time.” (BWM-00020085)⁷⁴; 10) another document admits that only some of the stacks are sampled on a given day (BWM-00020122 - BWM-00020123)⁷⁵; 11) a NUMEC document conceded as of 1971 that:

⁷⁰ Pls.’ Resp. Ex. 4.

⁷¹ ECF No. 161 at 23.

⁷² Pls.’ Resp. Ex. 7. Plaintiffs follow this observation with a series of quotes, but these quotes do not appear anywhere in the cited document and therefore they are not cited herein.

⁷³ Pls.’ Resp. Ex. 8.

⁷⁴ Pls.’ Resp. Ex. 9.

⁷⁵ Pls.’ Resp. Ex. 10. Again, Plaintiffs purport to quote from this document but the quotes do not appear therein.

Both State and Federal agencies are insisting on continuous stack sampling. Presently we do not even approach this condition Stacks are sampled a maximum of eight hours per month. . . . [T]he monthly sampling time is not necessarily representative of stack discharges. The detection of an accidental release would be “lucky” at best.

(BWM-00020122) (id.); 12) on October 25, 1963, NUMEC wrote, “There is no doubt that the frequency of bi-weekly sampling has been insufficient for the detection of intermittent or accidental releases of uranium materials. While it is recognized that continuous monitoring would be much preferred, the cost to date has been prohibitive.” (AA-67-1241, AA-67-1244)⁷⁶; and 13) a January 29, 1969, internal memorandum reveals that “I am not so much concerned over the activity levels as I am over the limited data on which the averages are based. It is not necessarily true that the stack sampling was concentrated on the stacks with the largest average activity.” (BWM-00020858).⁷⁷

Defendants indicate in their reply that Plaintiffs’ experts did not “testify” to these matters, but rather provided such opinions in their expert reports, prior to depositions at which they were asked specific questions about these opinions and qualified them. Further, they note that Dr. Melius’s report does not say that each Plaintiff had “sufficient exposure” to EU from Apollo “to be a cause of his cancer.”⁷⁸ Defendants argue that Mr. Franke did not proffer an opinion that airborne releases of EU from Apollo exceeded § 20.106 and Appendix B limits (based on measurements made at the boundaries or at the stacks and adjusted).

In addition, Defendants state that the report cited as Plaintiffs’ Exhibit 7 concerns occupational exposure of radioactivity for a certain set of employees at the former NUMEC

⁷⁶ Pls.’ Resp. Ex. 11.

⁷⁷ Pls.’ Resp. Ex. 12.

⁷⁸ Dr. Melius’s actual language is that each person’s exposure to EU from Apollo “made a significant contribution to the development of” that person’s cancer.

facility in Parks Township (not the Apollo plant), which is no longer at issue in this case, and it does not relate to the feasibility of dose reconstruction for the Apollo facility, much less the feasibility of estimating historical doses potentially received by members of the public.

Defendants note that the document cited as Plaintiffs' Exhibit 10 stated that "NUMEC is in compliance with" both conditions of having "roof edge continuous samplers ... within the limits of 10 C.F.R. 20 when averaged over one year, and ... NUMEC maintains an environmental sampling program in the neighboring unrestricted areas of the Apollo Plant" (BMW-00020122).

Plaintiffs cannot rely upon the reports of their experts as testimony when the experts were deposed and Defendants have accurately cited the testimony they made at their depositions under oath and subject to cross-examination. Further, the other documents upon which Plaintiffs rely either do not contain the quotes attributed to them or do not support Plaintiffs' contention that they have evidence of dose and exposure. Finally, as discussed above, Mr. Franke committed an error of law in relying upon unadjusted stack emission data to conclude that Defendants' airborne releases of EU from Apollo exceeded § 20.106 and Appendix B limits.

Standard for Exposure and Dose Requirements

As noted above, in the TMI case, the Court of Appeals held that the plaintiffs had to show that:

(1) the defendants released radiation into the environment in excess of the levels permitted by federal regulations in effect in 1979, i.e., 0.5 rem (500 mrem) or 5 mSv; (2) the plaintiffs were exposed to this radiation (although not necessarily at levels prohibited by those regulations); (3) the plaintiffs have injuries; and (4) radiation was the cause of those injuries. We have also held that the "exposure element requires that plaintiffs demonstrate they have been exposed to a greater extent than anyone else, i.e., that their exposure levels exceeded the normal background level."

193 F.3d at 659 (citing In re TMI, 67 F.3d at 1103). Regarding the causation element, each

plaintiff had to present evidence of “doses of radiation sufficient to cause” his or her injury. Id. at 623. See also In re TMI, 67 F.3d at 1119 (the “‘exposure’ element requires that plaintiffs demonstrate they have been exposed to a greater extent than anyone else, i.e., that their exposure level exceeds the normal background level.”) (citation omitted).

Every person is exposed daily to background radiation from various sources, both natural and man-made. In re TMI, 193 F.3d at 644-48. Thus, a plaintiff in a PLA must demonstrate that he or she was exposed to “this radiation,” that is, the radiation released from the Apollo facility allegedly in excess of the federal permissible limits. Id. at 659. As quoted above, a plaintiff must demonstrate exposure to levels above the normal background amounts. In the TMI case, the court noted that the “total annual average dose, from both natural and man-made radiation, is 3.6 mSv or 360 mrem.” Id. at 644. Defendants note that Plaintiffs’ expert, Dr. Ring, agrees that “300-millirem-per-year radiation dose” from background sources “would be typical” and that the actual background dose to individuals in the United States can vary depending on many factors, with annual whole-body doses ranging from 100 millirem to 2,000 millirem (or 2 rem). (Jan. 2, 2013 Ring Dep. at 119:14-120:17, 150:16-151:16.)

When a radioactive nuclide, or radionuclide, decays, it may emit an alpha particle or a beta particle or gamma rays. Alpha particles “have a low level of energy and, therefore, are only capable of penetrating matter a small distance.” 193 F.3d at 633 (footnote omitted). In fact, they “do not penetrate the layer of dead cells on the surface of the skin.” Id. at 637 n.36.

The time required for one-half of a given sample of an element to decay is known as the “half-life.” 193 F.3d at 632. Uranium 234, 235 and 238 have long half-lives. Id. at 632 n.24.

The court in TMI explained that radiation can cause cells to develop cancer, a “stochastic effect,” namely an event that occurs at random rather than predictably. 193 F.3d at 642.

Stochastic effects “are those whose probability of occurrence, as opposed to severity, is determined by dose.” Id. at 640. The court noted that:

Even at very low doses it is possible that ionizing radiation may deposit sufficient energy into a cell to modify it. Thus, there is a finite possibility for the occurrence of a stochastic event even at very small doses. Consequently, it is assumed that there is no threshold for the initiation of a stochastic event. Put another way, it is believed that stochastic effects can occur even at the lowest doses and, therefore, the possibility of a stochastic effect has to be taken into account at all doses. The probability that cancer will result from radiation increases proportionally with dose. However, it is currently believed that there is no threshold dose below which the probability of cancer induction is zero. It is presumed that any transformed cell can become cancerous and become a malignant tumor.

Id. at 642 (citations omitted).

Significantly, the court held that:

Although there is scientific consensus that ionizing radiation can cause cancer, ionizing radiation is not currently known to leave a tell-tale marker in those cells which subsequently become malignant. Medical examinations and laboratory tests can determine the type and extent of a cancer, suggest an optimal treatment, and provide a likely prognosis, but they rarely (if ever) provide definite information as to its cause. Consequently, medical evaluation, by itself, can neither prove nor disprove that a specific malignancy was caused by a specific radiation exposure. Therefore, the primary basis to link specific cancers with specific radiation exposures is data that has been collected regarding the increased frequency of malignancies following exposure to ionizing radiation. In other words, causation can only be established (if at all) from epidemiological studies of populations exposed to ionizing radiation.

However, the task of establishing causation is greatly complicated by the reality that a given percentage of a defined population will contract cancer even absent any exposure to ionizing radiation. In industrialized countries where the life expectancy averages about 70 years, about 30% of the population will develop cancer and about 20% of the population will die of cancer. It is estimated that if 100,000 persons with an age and sex distribution typical of the United States are exposed to a whole body dose of 0.1 Sv and are followed over their lifetimes, between 770–810 people would develop fatal cancers in excess of the normal incidence.

Id. at 643-44 (citations omitted).

The court noted that radiation is a “constituent element of our environment, and mankind

has been exposed to it since our first appearance on this planet.” Id. at 644. The average annual dose of natural radiation in the United States is around 300 millirems, id. at 644 & n.50, to which medical irradiation (primarily from x-rays) added (at the time of the TMI case) an additional 40 to 100 millirems, id. at 647 & n.58. In this case, expert testimony was introduced that currently medical procedures provide an annual average of 300 millirems. (Daubert Hr’g Day 2 at 193-94.)⁷⁹

In TMI, the court held that the “critical issue ... is the trial plaintiffs’ ability to demonstrate that they were exposed to doses of radiation sufficient to cause their neoplasms.” 193 F.3d at 622-23. Because governmental studies showed no significant differences in cancer rates between studied groups and state and national norms, the plaintiffs attempted to show that they were exposed to significantly higher doses of ionizing radiation than the governmental studies calculated, relying upon a “blowout” theory in which an extremely dense, yet narrow, plume of radioactive traveled through the atmosphere evading all the radiation monitors in the areas surrounding the plant and communities. Id. at 660-62. However, the court concluded that the blowout theory was not supported by expert testimony (because the plaintiffs’ experts did not survive a Daubert challenge) and therefore they failed to produce evidence that they were exposed to doses of radiation sufficient to cause their neoplasms and the case was dismissed.

Similarly, the Pennsylvania Supreme Court has recognized that “dose [i]s the single most important factor to consider in evaluating whether an alleged exposure caused a specific adverse effect.” Betz v. Pneumo Abex LLC, 44 A.3d 27, 31, 44 n.14 (Pa. 2012) (citation omitted). See also Allen v. Pa. Eng’g Corp., 102 F.3d 194, 199 (5th Cir. 1996); Mitchell v. Gencorp Inc., 165

⁷⁹ ECF No. 265.

F.3d 778, 781 (10th Cir. 1999); Cano v. Everest Minerals Corp., 362 F. Supp. 2d 814, 848 (W.D. Tex. 2005).

Plaintiffs argue that the TMI cases do not require them to demonstrate that they were exposed to a particular numerical dose of radiation, pointing to the statement that “Trial Plaintiffs proceeded to try their respective claims on the theory that each of the Trial Plaintiffs had been exposed to an equivalent dose of at least 10 rem or 100 mSv each.” 193 F.3d at 661 (footnote omitted). They also emphasize the Court of Appeals’ acknowledgement that “scientists assume that there is no threshold for the induction of cancer” and that “ionizing radiation can cause cancer even at the lowest doses, and therefore it has to be taken into account at all dose levels.” Id. at 726 (citations omitted).

It is true that the TMI plaintiffs proposed to demonstrate that they had been exposed to an equivalent dose of at least 10 rem and that the court concluded that their experts could not make this connection and excluded them under Daubert, thereby undermining their case. Nevertheless, the significance of TMI is not that plaintiffs in every PAA case must demonstrate that they were exposed to an equivalent dose of at least 10 rem, but that they were exposed to the radiation that they claim caused their injuries. That is, in this case, Plaintiffs still must demonstrate that they were exposed to “this radiation,” that is, inhaled uranium from the Apollo plant in excess of normal background radiation amounts. Otherwise, they cannot demonstrate causation.

Thus, the law is clear that Plaintiffs must provide evidence of their exposure to inhaled uranium from the Apollo plant and an estimate of the dose they received which caused their cancers. Yet, as summarized above, Plaintiffs’ experts have failed to meet this evidentiary burden. Mr. Franke, Dr. Ring, Dr. Ketterer and Dr. Hu were not asked to calculate exposure and dose and did not do so, and Dr. Melius therefore cannot rely upon their analyses to conclude that

each Plaintiff had sufficient exposure to uranium from the Apollo plant to be a cause of his or her cancer. Defendants note that even Dr. Melius, when asked “do you also agree with the scientific proposition that in order to understand whether exposure to radiation caused a particular effect, you need to know the dose to the organ of interest for that particular cancer, right?” responded “Correct.” (Daubert Hr’g Day 1 at 117:3-9.)⁸⁰

In their brief in opposition to Defendants’ motion, Plaintiffs make the following statement: “Dr. Melius’s testimony, which has been ruled admissible, must be accepted as true for purposes of Defendants’ summary judgment motion. [Cite] That testimony is expressly dispositive of the exposure and dose elements of Plaintiffs’ claims, and thus of Defendants’ Motion.” (ECF No. 340 at 2-3.) Defendants noted this lack of support in their reply brief (ECF No. 360 at 9 n.3), but Plaintiffs made no effort to correct it, nor did they request leave to file a sur-reply brief. Therefore, they have not provided any basis for disputing Defendants’ contention that Dr. Melius’s testimony (albeit admissible) is not sufficient to sustain Plaintiffs’ burden in these cases.

Law of the Case Doctrine

Plaintiffs contend that the law of the case doctrine bars reconsideration of this issue, which was decided in the context of the Daubert motions; and that Defendants are estopped from arguing that Plaintiffs have not met their burden to produce evidence of exposure and dose. Defendants reply that neither legal theory applies.

The law of the case “posits that when a court decides upon a rule of law, that decision should continue to govern the same issues in subsequent stages in the same case. This rule of

⁸⁰ ECF No. 364.

practice promotes and efficiency of the judicial process by protecting against the agitation of settled issues.” Christianson v. Colt Indus. Operating Corp., 486 U.S. 800, 816 (1988) (citations omitted). However, the “law of the case doctrine has no bearing on the revisiting of interlocutory orders,” which “remain open to trial court reconsideration, and do not constitute the law of the case.” United States v. Bergrin, 682 F.3d 261, 285 (3d Cir. 2012) (citations omitted). In addition, the doctrine is discretionary. Coca-Cola Bottling Co. of Shreveport, Inc. v. Coca-Cola Co., 988 F.2d 414, 429 (3d Cir. 1993).

Defendants argue that the fact that their Daubert motions were denied and the testimony of Plaintiffs’ experts was deemed admissible does not mean that the Court has resolved whether Plaintiffs have proffered sufficient evidence to survive summary judgment. “Even when a court determines that expert opinion evidence is admissible, it must still determine whether it would be sufficient to sustain a jury verdict in plaintiff’s favor.” Wade-Greaux v. Whitehall Labs., Inc., 874 F. Supp. 1441, 1485 (D.V.I. 1994), aff’d mem., 46 F.3d 1120 (3d Cir. 1994).

Plaintiffs admit that:

Defendants correctly point out that a Daubert ruling does not automatically govern a subsequent summary judgment issue. But here, the legal propositions upon which Defendants rely in arguing for summary judgment are the same as those this Court considered (and rejected) in ruling on Defendants’ Daubert arguments. Indeed, Defendants contended before this Court and the Court of Appeals that essentially the same issues as to exposure and dose constituted “controlling questions of law” for purposes of Defendants’ Petition for interlocutory appeal. Consequently, this Court’s rulings on those questions of law must be deemed the law of the case.

(Pls.’ Br. Opp’n at 5.)⁸¹ The court in TMI stated that: “A court is not precluded from granting summary judgment merely because expert testimony is admitted. If, even given the proffered

⁸¹ ECF No. 340.

expert testimony, the proponent still has failed to present sufficient evidence to get to the jury, summary judgment is appropriate.” TMI, 193 F.3d at 716 (quotation omitted). Indeed, the court in TMI held that the district court had erred in excluding a portion of a particular cancer study, but when it examined the improperly excluded expert testimony, the court concluded that it was insufficient to create a material issue of fact. Id. at 716-17.

As Judge Conti stated, when presented with this same argument:

The court disputes plaintiffs’ assertion that “the Court has already decided that Plaintiffs may proceed with their case on causation.” Pl.’s Br. in Opp. (Doc. No. 120) at 19. In a Daubert hearing, district courts perform a “gatekeeper” function with respect to the admissibility of expert testimony. This function requires the court to make certain that “evidence presented by expert witnesses is relevant, reliable, and helpful to the jury’s evaluation of such evidence.” Elcock v. Kmart Corp., 233 F.3d 734, 744 (3d Cir. 2000) (citing Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579, 597, 113 S.Ct. 2786, 125 L.Ed.2d 469 (1993)). At the outset, the district court must determine whether an expert is proposing to testify to scientific or other specialized knowledge that will assist the trier of fact to determine a fact in issue. Daubert, 509 U.S. at 592; see also Kuhmo Tire Co., Ltd. v. Carmichael, 526 U.S. 137, 119 S.Ct. 1167, 143 L.Ed.2d 238 (1999). The court in a Daubert hearing, thus, determines the admissibility of expert evidence, not whether such evidence is sufficient with respect to a matter upon which the plaintiff has the burden of proof. Plaintiff’s argument does not recognize this fundamental difference. Accordingly, the court will proceed to examine the expert evidence offered in support of each plaintiff regarding causation.

Shetterly v. Sony Elec., Inc., 2005 WL 2219473, at *8 n.17 (W.D. Pa. Sep. 13, 2005).

Plaintiffs cite Judge Cercone’s opinion on the Daubert motions, in which the Court referred to Mr. Franke’s affidavit regarding hypothetical lung dose estimates for an individual exposed to the 1963 vault fire and then stated that “Franke’s findings demonstrate that Defendants ‘regularly and repeatedly’ violated the standard of care identified in 10 C.F.R. §§ 20.105 and 20.106.” (Daubert Op. at 31.) However, as explained above, § 20.105 does not apply in this case, Mr. Franke did not identify the source of his “lung dose” limits and the Court

was not tasked with determining whether Defendants violated § 20.106, only whether Franke's opinion that they did was relevant to the question of their alleged breach of the standard of care. The Court's actual holding was narrow: "Franke's opinion is relevant to Defendants' alleged breach of the standard of care, and Defendants' motion to exclude such opinion will be denied." (Id.)

In addition, in the Lone Pine opinion, the Court stated that it was not addressing the merits of Plaintiffs' claims. (ECF No. 161 at 7 n.1, 25.) Thus, the Court has not answered this question previously.

Plaintiffs also argue that, in the Hall case, Judge Ambrose rejected the argument that the plaintiffs lacked sufficient evidence of causation. In fact, the court's discussion of this issue was as follows:

Plaintiffs' causation experts, Drs. Melius and Radford employed a differential diagnosis methodology in arriving at their opinions. Differential diagnosis is a methodology used to determine causation of a disease suffered by an individual, based on efforts to consider and exclude all possible alternate causes. As set forth by the Court of Appeals in Kannankeril v. Terminix Int'l, Inc., 128 F.3d 802 (3d Cir. 1997) and In re Paoli Railroad Yard PCB Litig., 35 F.3d 717 (3d Cir. 1994), the admissibility requirements of causation testimony in this case were met. Dr. Radford examined many factors in each Plaintiff's background. Additionally, he reviewed and used the information arrived at by Plaintiffs' dosimetry experts. As set forth more fully within, Radford's differential diagnosis evaluated all available information about each Plaintiff, determined the "most likely" diagnosis and tested the hypothesis by considering other possible diagnoses. His conclusions were scientifically reliable and sufficient to meet Plaintiffs' burden of establishing causation.

In the same manner, Dr. Melius also employed a differential diagnosis methodology. The arguments Defendants make about his testimony are essentially the same as those made about Dr. Radford and his opinions. Dr. Melius also relied on dose information provided by other experts; considered all factors relating to each Plaintiff which may have increased their susceptibility to the risks associated with radiation exposure; and eliminated other potential causes of Plaintiffs' cancers based on a thorough review and examination of all available data. This is what a differential diagnosis is and it was an appropriate and sound methodology

on which this expert based his opinion.

Hall, 69 F. Supp. 2d at 721. See also id. at 727 (Dr. Radford's differential diagnosis methodology relied upon, inter alia, "the dosimetry calculations of Plaintiffs' dose experts" and was therefore admissible under Daubert); id. at 728 ("Dr. Melius evaluated the exposure of each Plaintiff by reference to the dose estimate provided by Plaintiffs' dose experts" and therefore his testimony was admissible under Daubert).

In this case, however, Dr. Melius has not "relied on dose information provided by other experts" and there are no "dosimetry reports." (Daubert Hr'g Day 1 at 156:6-158:7.) Thus, this case is distinguishable from Hall. Plaintiffs have not explained how Dr. Melius can rely upon dose information that experts prepared in the Hall case, which involved different individuals.

Estoppel

Plaintiffs argue that Defendants are estopped from contesting their lack of evidence of exposure and dose essentially because Defendants are responsible for the missing evidence in that they failed to keep records which would have allowed Plaintiffs to meet their burden. Defendants respond that this argument is both legally and factually flawed.

Plaintiffs cite a statement from an antitrust case, Bigelow v. RKO Radio Pictures, 327 U.S. 251, 265 (1946), that "the wrongdoer shall bear that risk of the uncertainty which his own wrong has created." However, that case applied a relaxed standard for proving the amount of damages after antitrust liability had been proven. As the Court of Appeals subsequently noted: "The relaxed measure of proof is afforded to the amount, not the causation of loss—the nexus between the defendant's illegal activity and the injuries suffered must be reasonably proven." In re Lower Lake Erie Iron Ore Antitrust Litig., 998 F.2d 1144, 1176 (3d Cir. 1993). In any event, Plaintiffs have not explained how this statement applies to determining liability (not the amount

of damages) under the PAA, which is specifically articulated in the statute and reflected in its own body of case law.

Similarly, Plaintiffs cite a district court opinion which held that:

Where a defendant who negligently creates a radiological hazard which puts an identifiable population group at increased risk, and a member of that group at risk develops a biological condition which is consistent with having been caused by the hazard to which he has been negligently subjected, such consistency having been demonstrated by substantial, appropriate, persuasive and connecting factors, a fact finder may reasonably conclude that the hazard caused the condition absent persuasive proof to the contrary offered by the defendant.

Allen v. United States, 588 F. Supp. 247, 415 (D. Utah 1984), rev'd on other grounds, 816 F.2d 1417 (10th Cir. 1987). As Defendants point out, however, this case predated the Price Anderson Amendments Act of 1988 and it directly conflicts with TMI, which interpreted those amendments to require a plaintiff to prove all the elements of a PLA.

In addition, Defendants contend that Plaintiffs' argument is factually unsupported because the scientific community explicitly provides for techniques to account for missing data. Specifically, the National Research Council states that:

Short periods of missing data can be bridged by interpolation between periods for which discharges are known. Longer periods might require extrapolation of release rates using changes in plant operations as a guide. For releases that were never measured or that were sampled only occasionally, it might be necessary to develop a model of the release that is related to the production process that caused it....

Gaps in information should be filled, as far as possible, by extrapolation of release data obtained for comparable operating periods or by reconstruction from other data such as exposure records, environmental monitoring results, or waste shipment records.... [R]elease fractions can be estimated from records that detail the throughput of the material, its physical and chemical characteristics, and the facility's effluent treatment systems.

Radiation Dose Reconstruction For Epidemiologic Uses (1995) (Reply App. Ex. A at 20, 24.)

Similarly, the National Council on Radiation Protection and Measurements (NCRP) has

confirmed in one of its key scientific publications that missing data may be mathematically modeled: “In some cases, there may be little relevant data, and mathematical modeling must be relied upon almost exclusively.” (Defs.’ Reply App. Ex. B, NCRP Report No. 163, at 31.) And the Federal Judicial Center’s Reference Manual on Scientific Evidence endorses the use of scientific exposure assessment to estimate the doses received by plaintiffs who allege injuries from toxic substances. See Reference Manual on Scientific Evidence, Reference Guide on Exposure Science (Federal Judicial Center, 3d ed. 2011) (“Reference Manual”), at 533-34. The Reference Manual notes that “[w]hen a chemical must move from one or more sources, and then through one or more environmental media, before it comes to be present in the media with which people have contact (the media of exposure), determining the concentrations of the chemical in the media of exposure becomes difficult.” *Id.* at 527. Defendants note that the Reference Manual provides that the solution to this common challenge is that experts must “estimate concentrations in the medium of human exposure” using either direct measurements (when available) or “use of models that are intended to quantify the concentrations resulting from the movement of chemicals from the source to the media of human exposure.” Once such concentrations have been reliably estimated, “dose is readily calculated.” *Id.* at 528.

The Supreme Court has recognized that “[t]rained experts commonly extrapolate from existing data.” General Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997). See also Northbrook NY, LLC v. Lewis & Clinch, Inc., 2012 WL 4338740, at *6 (N.D.N.Y. Sep. 20, 2012) (rejecting Daubert challenge on the ground that the expert, a professional engineer, had extrapolated from existing data to reach his result). The court in TMI indicated that: “To estimate the effect of a given type of radiation on body tissue, it is necessary to determine the dose equivalent. The dose equivalent is arrived at by multiplying the absorbed dose by the quality factor of the radiation.”

193 F.3d at 638. Failure to provide any estimate of exposure and dose, on the other hand, means that a plaintiff has not met his burden of establishing causation. See Perry v. Novartis Pharms. Corp., 564 F. Supp. 2d 452, 472 (E.D. Pa. 2008) (rejecting experts who “ma[d]e no attempt to demonstrate sufficient dosage, but instead simply ignore[d] the question of dosage entirely making only vague and unquantifiable statements like “Andreas Perry was exposed to a substantial amount of pimecrolimus cream for a prolonged period of time.”)

Plaintiffs have not responded to this argument. Given that the scientific community has developed specific methods for dealing with missing data, Plaintiffs cannot simply contend that their burden of proffering evidence of exposure and dose is somehow reduced or eliminated because Defendants did not keep all the records they were required to maintain. Rather, Plaintiffs had the burden to have their experts estimate values for the missing data, an obligation which they have not met.

For all these reasons, it is recommended that Defendants’ motion for summary judgment as to Plaintiffs’ failure to proffer evidence of exposure and dose should be granted.

Remaining Motions

Defendants have also moved for summary judgment in the first eleven cases on other grounds, specifically: 1) Atlantic Richfield has moved for summary judgment on the basis that it cannot be held liable as a successor in interest to NUMEC; and 2) Defendants have challenged certain individual plaintiffs for having violated this Court’s order of September 12, 2012 by continuing to allege exposure other than to inhaled uranium emitted from the Apollo plant. Because the Court should grant summary judgment for Defendants for the reasons outlined above, it is not necessary for the Court to reach these issues. Therefore, it is recommended that the remaining motions be dismissed as moot.

If this Report and Recommendation is adopted, the first eleven cases would be dismissed and the four more recent cases would consist solely of the Price Anderson Act claim in Count I. Now that expert discovery has been completed in the four more recent cases, further motions may be scheduled.

For these reasons, it is respectfully recommended that Defendants' Motion for Judgment on the Pleadings on Counts Two Through Five/Six/Seven Based on Price-Anderson Act Preemption be granted. It is further recommended that Defendants' Motion for Summary Judgment Based on Plaintiffs' Failure to Raise a Genuine Issue for Trial on Breach of Duty be granted. It is further recommended that Defendants' Motion for Summary Judgment Based on Plaintiffs' Lack of Evidence Regarding Exposure and Dose be granted and that Defendants' Motion to Deem Admitted Rule 56.B.1 Statement of Undisputed Facts in Support of Summary Judgment Based on Plaintiffs' Lack of Evidence Regarding Exposure and Dose be granted. It is further recommended that Defendant Atlantic Richfield Company's Motion for Summary Judgment Based on No Shareholder Liability be dismissed as moot and that Defendant Atlantic Richfield Company's Motion to Deem Admitted Its Local Rule 56.B.1 Statement of Undisputed Facts in Support of Summary Judgment Based on No Shareholder Liability be dismissed as moot. It is further recommended that Defendants' Motion for Summary Judgment Due to Plaintiffs' Failure to Comply With the Court's September 12, 2012 Order be dismissed as moot and that Defendants' Motion to Strike the Supplemental Affidavit of James Melius, M.D., DR. P.H. be dismissed as moot.

Litigants who seek to challenge this Report and Recommendation must seek review by the district judge by filing objections by May 21, 2015. Any party opposing the objections shall file a response by June 4, 2015. Failure to file timely objections will waive the right of appeal.

s/Robert C. Mitchell
ROBERT C. MITCHELL
UNITED STATES MAGISTRATE JUDGE

Dated: May 7, 2015